FINAL
Site Inspection Report Hammond Bombing and Gunnery Range
Tangipahoa Parish, Louisiana

U.S. Army Corps of Engineers
Southwest IMA Region

FUDS Project No. A06LA030901
Contract: W912DY-04-D-0005
Task Order: 0009

Prepared For:
U.S. Army Corps of Engineers, Fort Worth District
819 Taylor Street
Fort Worth, Texas 76102-0300
and
U.S. Army Corps of Engineers
South Pacific Division Range Support Center

Prepared By:
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June 2009

The views, opinions, and/or findings contained in this 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

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June 29, 2009

U.S. Army Corps of Engineers, Fort Worth District
ATTN: CESWF (Ms. Patience Nwanna)
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Subject: Contract W912DY-04-D-0005, Delivery Order 0009
MMRP SI for SW IMA Region – Final Site Inspection Report for
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana
(FUDS Project No. A06LA030901)

Dear Ms. Nwanna:

Parsons has prepared this Final Site Inspection (SI) for Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana. Nine copies have been provided for your file. We have simultaneously forwarded copies as indicated below.

If you have any questions or comments, please contact me at (678) 969-2384, the Co-Program Manager, Ms. Laura Kelley, at (678) 969-2317, or the Texas SI Team Leader, Ms. Julie Burdey, at (512) 719-6062.

Sincerely,

PARSONS

Don Silkebakken, P.E.
MMRP SI Program Manager

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Laura Kelley (Parsons CPM), Project File (744653.84115)

U.S. Army Corps of Engineers

FINAL

Site Inspection Report
Hammond Bombing and Gunnery Range
Tangipahoa Parish, Louisiana

FUDS Project Number A06LA030901

June 2009

In Support of

FUDS MMRP Site Inspections Project

Prepared by

PARSONS
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Norcross, Georgia 30092

Prepared for

U.S. Army Corps of Engineers, Fort Worth District
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and

U.S. Army Corps of Engineers
South Pacific Division Range Support Center

Contract No. W912DY-04-D-0005
Task Order 0009
Project No. 744653

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Parsons has completed the Final Site Inspection report for Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions was verified. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing USACE policy.

June 29, 2009

Study/Design Team Leader and Team Members

June 29, 2009

Independent Technical Review Team Leader

Significant concerns and the explanation of the resolution are as follows:

None

As noted above, all concerns resulting from independent technical review of the project have been considered.

June 29, 2009

Parsons Program Manager(s)

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AAF	Army Airfield
AOI	Area of interest
asl	above sea level
ASR	Archives Search Report
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESPA	United States Army Corps of Engineers, Albuquerque District
CESWF	United States Army Corps of Engineers, Fort Worth District
CFR	Code of Federal Regulations
CSEM	conceptual site exposure model
CSM	conceptual site model
CZMA	Coastal Zone Management Act
CZMP	Coastal zone management program
DERP	Defense Environmental Restoration Program
DMM	Discarded Military Munitions
DoD	Department of Defense
DQO	data quality objective
DU	Decision unit
ER	engineering regulation
FUDS	formerly used defense site
GPS	global positioning system
HE	high explosive
HRS	hazard ranking system
INPR	Inventory Project Report
LDEQ	Louisiana Department of Environmental Quality
MC	munitions constituent
MD	munitions debris
MEC	munitions and explosives of concern
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/L	micrograms per liter
MIS	Multi-incremental sampling
MMRP	military munitions response program
MRDS	Mineral Resources Data System
MRS	munitions response site

MRSPP	munitions response site prioritization protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetlands Inventory
PSAP	programmatic sampling and analysis plan
PWP	programmatic work plan
QA	quality assurance
QC	quality control
QR	qualitative reconnaissance
RAC	risk assessment code
RECAP	Risk Evaluation/Corrective Action Program
RI/FS	remedial investigation/feasibility study
SI	site inspection
SLERA	screening level ecological risk assessment
SLRA	screening level risk assessment
SS-WP	site-specific work plan
TPP	technical project planning
USACE	U.S. Army Corps of Engineers
USAESCH	United States Army Engineering and Support Center, Huntsville
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	unexploded ordnance

GLOSSARY OF TERMS

anomaly	Any item that deviates from the expected subsurface ferrous and non-ferrous material at a site (*i.e.*, pipes, power lines, *etc.*).
magnetometer	An instrument for measuring the strength of a magnetic field; used to detect buried iron and other metal objects.
military munitions	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.
munitions and explosives of concern (MEC)	Military munitions that may pose unique explosives safety risks, including unexploded ordnance, discarded military munitions, or munitions constituents present in high enough concentrations to pose an explosive or other health hazard.
munitions constituents (MC)	Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.
munitions debris (MD)	Remnants of munitions (*e.g.*, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.
munitions response	Response actions, including investigation, removal actions, and remedial actions, to address the explosive safety, human health, or environmental risks presented by unexploded ordnance, discarded military munitions, or munitions constituents, or to support a determination that no removal or remedial action is required.

munitions response site (MRS)	A discrete location known to require a munitions response.
projectile	Object projected by an applied force and continuing in motion by its own inertia. This includes bullets, bombs, shells, grenades, guided missiles, and rockets.
unexploded ordnance (UXO)	Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; that have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material; and that remain unexploded whether by malfunction, design, or any other cause.

EXECUTIVE SUMMARY

ES1 The objective of this site inspection (SI) was to determine whether the former Hammond Bombing and Gunnery Range in Tangipahoa Parish, Louisiana warrants further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) beyond the SI stage. There are five munitions response sites (MRS) located within the Formerly Used Defense Site (FUDS) property at Hammond Bombing and Gunnery Range, as follows:

- Bomb Target #1 (MRS01);
- Multiple Use Target (MRS02);
- Bomb Target #2 (MRS03);
- Rifle Range (MRS04); and
- Gunnery Range (MRS05).

In addition, a potential area of interest (AOI), an area with possible cratering, was identified during the technical project planning (TPP) meeting, as described below.

ES2 The recommendations for the MRSs could include no further Department of Defense (DoD) action indicated (NDAI), further evaluation as part of a remedial investigation/feasibility study (RI/FS), or a time critical removal action (TCRA).

ES3 The investigation of Hammond Bombing and Gunnery Range, which operated as a bombing and gunnery range from August 1942 to September 1945, was performed to confirm known target locations and to evaluate evidence for the presence of munitions and explosives of concern (MEC) and munitions constituents (MC) at the site. To accomplish this objective, qualitative reconnaissance (QR) and MC sampling were performed. Munitions reportedly used at the site include AN-M30 100-lb. general purpose bombs, MK I 100-lb. general purpose bombs, M38A2 100-lb. practice bombs, M85 100-lb. concrete practice bombs, M5 2.25-inch practice rockets, M1A1/M3/M5 spotting charges, 0.50-caliber machine gun ammunition, AN-MK4 3-lb. practice bombs, AN-MK5 3-lb. practice bombs, AN-MK23 3-lb. practice bombs, AN-MK43 4.5-lb. practice bombs, and general small arms ammunition.

ES4 The SI technical approach was agreed to at the February 14, 2008 TPP meeting by the TPP Team. Based on historical information, it was agreed at the TPP meeting that MRS01, MRS02, and MRS03 would likely proceed to RI/FS and MRS04 and MRS05 would likely proceed to NDAI. It was proposed during the TPP process and documented in the Site-Specific Work Plan (SS-WP) that collection of eight multi-incremental surface soil samples (with one triplicate) and conducting approximately 19.1 miles of QR would be sufficient to meet the SI project objectives. No sediment, groundwater, or surface water

samples were planned at the TPP meeting. However, well data were obtained after the TPP meeting that showed numerous wells are present in the vicinity of the site, including several within the site area. Therefore, three groundwater samples were added to the planned sampling activities, dependent on the availability of access to onsite wells.

ES5 During the TPP meeting, Deputy Sheriff Tom Davidson of the Tangipahoa Parish Sheriff's Department indicated that he is familiar with the history of Hammond Bombing and Gunnery Range because he helped research a book titled *Hammond Army Air Field and Early Aviation in the Hammond Area* (Ford 1996). At the TPP meeting, Sheriff Davidson pointed out locations on the map and referred to them as a "demolition area" within the Gunnery Range MRS; a "rifle range berm area" within the Rifle Range MRS; "strafing targets" within the Gunnery Range MRS; and an "area of potential cratering" north of the Bomb Target #2 MRS. The area of potential cratering Deputy Sheriff Tom Davidson referred to is identified as a potential area of interest (AOI) because it is located outside of the MRS boundaries. Additionally, Mr. Davidson suggested that the location of the Multiple Use Target, as presented in the Archives Search Report (ASR) Supplement (USACE 2004b), is approximately 4,500 feet too far to the north and the firing point does not lie outside the FUDS boundary. An adjusted boundary for the Multiple Use Target is presented on the report figures, consistent with Mr. Davidson's description.

ES6 The SI evaluation included performing approximately 22.4 miles of QR (3.3 additional miles to that agreed to in the TPP meeting). The QR did not locate any MEC at any of the MRSs, but MD was observed within the overlapping portions of the Rifle Range and Gunnery Range MRSs, and just to the north of the Gunnery Range MRS, in the potential area of interest (AOI) reference by Mr. Davidson and as identified in the SS-WP (adjusted Multiple Use Target). A total of 66 observations (Figure ES-1) were noted by the SI field team to include soil type, topography, vegetation and evidence of past DoD use (Appendix E) and no indications of past DoD use were observed besides the two 0.50-caliber MD items. No military-related structures or craters were observed. Some large depressions that initially appeared to be craters were observed, but could not be confirmed to be craters based on lack of metallic material within or surrounding the depressions.

ES7 During the SI, eight multi-incremental surface soil samples (including one triplicate) and three groundwater samples (including one duplicate) were collected at the site. Six of the surface soil samples were biased samples located within Hammond Bombing and Gunnery Range MRSs, one was located in the area of potential cratering AOI, and the remaining sample, an ambient background sample, was located south of the site MRSs. One of the groundwater samples was collected within a site MRS (Bomb Target #1), while the other two groundwater samples were collected along the western and southern edges of the site, outside of the MRSs. The biased samples were collected in areas considered to have the highest likelihood for residual MEC and MC contamination, if present (see Figure ES.1).

ES8 APPL, Inc. in Fresno, California analyzed the surface soil samples for explosives and select metals (aluminum, antimony, chromium, copper, lead, and zinc). Groundwater samples were analyzed for explosives, perchlorate, and select metals (aluminum, antimony, chromium, copper, lead, and zinc). No metals were detected above background in

surface soil or groundwater samples collected at the site. No perchlorate was detected in groundwater samples collected at the site. No explosive compounds were detected in the groundwater samples. One explosive compound, "nitroglycerin", was detected in one surface soil DU sample. The sample with the nitroglycerin detection was not collected within an MRS, but was collected within the AOI identified by the Tangipahoa Sheriff during the TPP meeting as an "area of potential cratering." Therefore, based on the sampling and analysis conducted, no MC contamination was identified at the site MRSs. Since no receptor pathways were complete for any MRSs (based on lack of MC contamination), no human health screening level risk assessments nor screening level ecological risk assessments were required. MC contamination was identified at the AOI. Being the AOI is not an MRS it was not evaluated for risk. This detection is indicative of a potential MC release or an effect of tree stump blasting, as described in Subchapter 5.8.1.

ES9 Based on the qualitative MEC risk evaluation, there is the possibility that human receptors might come into contact with explosively hazardous MEC at Bomb Target #1, the Multiple Use Target, and Bomb Target #2. Therefore, there is the potential for an explosive safety risk at these MRSs. However, no explosive hazards remain at the Rifle Range or Gunnery Range and, therefore, no explosive safety risk is considered to be present at these MRSs. Based on results of the MC and MEC risk evaluations, it is recommended that MRS01, MRS02, and MRS03 proceed to RI/FS and MRS04 and MRS05 proceed to NDAI. It is also recommended that the area of potential cratering AOI be investigated further and the location of the Multiple Use Target be evaluated to see if it is placed correctly on historical maps.

Table ES.1
Recommendations
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

MRS	Recommendation	Rationale
Bomb Target #1	RI/FS	• ASR site inspection team observed numerous bomb craters surrounded by pieces of high explosive (HE) bomb fragments during April 2002 inspection. • MEC risk assessment concluded that some potential remains for human receptors to come into contact with surface or subsurface MEC items at this MRS.
Multiple Use Target	RI/FS	• ASR site inspection team observed multiple MD items during April 2002 site visit. Site visit team also found bomb cratering in the target area. • MEC risk assessment concluded that some potential remains for human receptors to come into contact with surface or subsurface MEC items at this MRS.
Bomb Target #2	RI/FS	• ASR site inspection team observed numerous craters and pieces of M38A2 100-lb. practice bombs during April 2002 inspection. Site inspection team noted craters were large enough that they may have been created by HE bombs. • MEC risk assessment concluded that some potential remains for human receptors to come into contact with surface or subsurface MEC items at this MRS.
Rifle Range	NDAI*	• ASR site inspection team only observed small arms MD during April 2002 inspection. Site inspection team noted no cratering or areas of stressed vegetation. • MEC risk assessment concluded no explosive safety risk is considered to be present. • Although recommended for NDAI, this area will be addressed as a portion of the adjusted boundary for the Multiple Use Target during the RI/FS.*

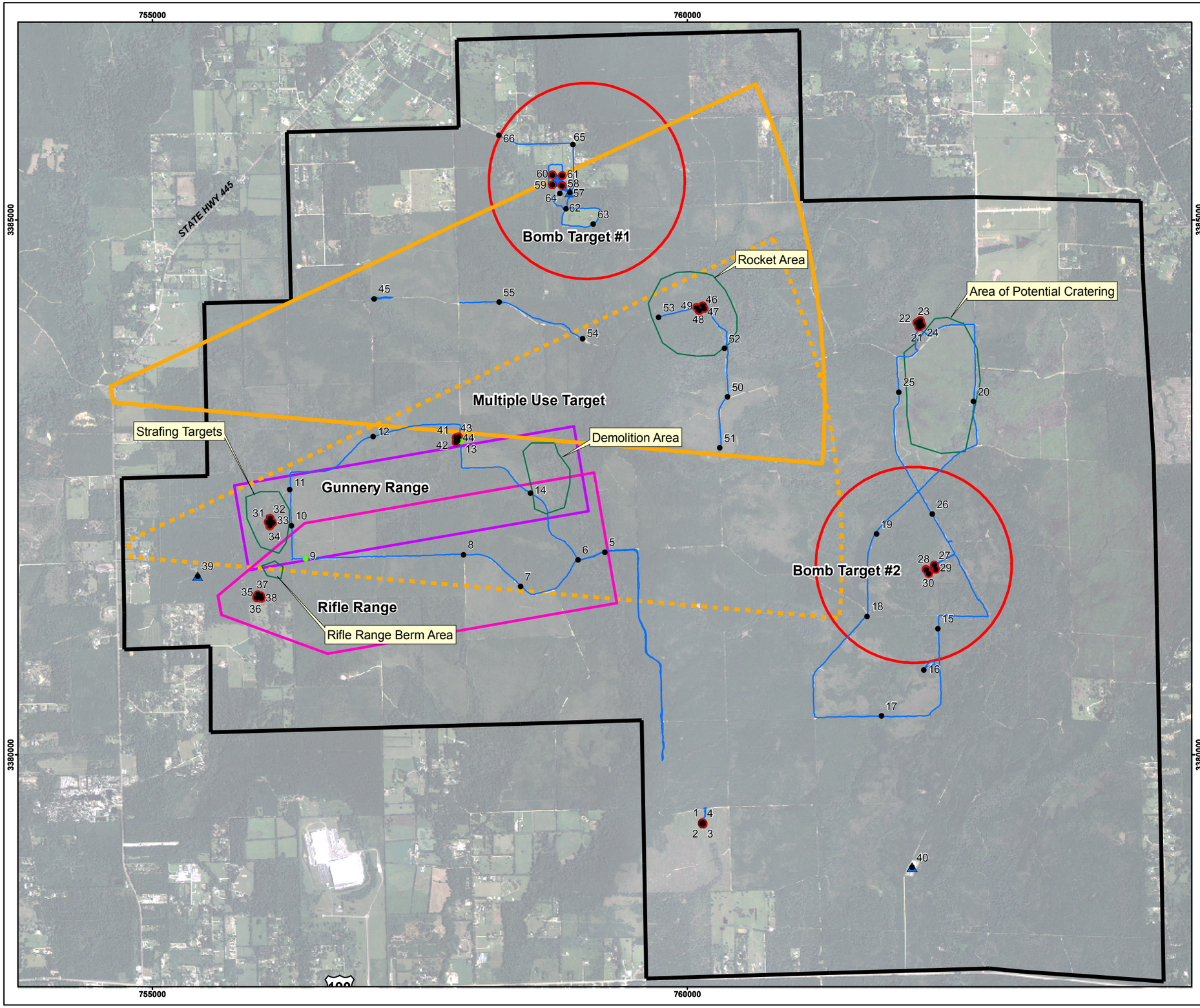
Gunnery Range	NDAI*	• ASR site inspection team only observed small arms MD during April 2002 inspection. Site inspection team noted no cratering or areas of stressed vegetation. • MEC risk assessment concluded no explosive safety risk is considered to be present. • Although recommended for NDAI, this area will be addressed as a portion of the adjusted boundary for the Multiple Use Target during the RI/FS.*

Figure ES.1

General Site Overview

Hammond Bombing and Gunnery Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Munitions Debris Location
- Other Field Observation Location
- Surface Soil Sample Location (Decision Unit)
- Groundwater Sample Location
- Qualitative Reconnaissance Track
- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary
- Adjusted Location of Multiple Use Target Based on Stakeholder Information
- Area of Potential Cratering AOI

Site Location in Louisiana

N

Image Source: Orthophoto, 2006
Projection: UTM Zone 15 NAD83, Map Units in Meters

Feet
3,000 1,500 0 3,000

PARSONS	U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	General Site Overview		
DRAWN BY: BT	SCALE: As Shown	PROJECT NUMBER: 744653.84115	
CHECKED BY: JB	DATE: June 2009	PAGE NUMBER: ES-6	
SUBMITTED BY: DS	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\FigES_1.mxd		

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

1.1.1 Parsons received Contract Number W912DY-04-D-0005, Task Order Number 0009, from the United States Army Corps of Engineers (USACE), Engineering and Support Center, Huntsville (USAESCH) to perform a Site Inspection (SI) of the Hammond Bombing and Gunnery Range, Formerly Used Defense Site (FUDS) Project Number A06LA030901. Hammond Bombing and Gunnery Range is located in Tangipahoa Parish, Louisiana, and the property boundary encompasses approximately 15,215.9 acres of land. The location and boundaries of Hammond Bombing and Gunnery Range are shown in Figure 1.1. There are five munitions response sites (MRS) within Hammond Bombing and Gunnery Range, and they encompass 6,045 acres of land. These MRSs are Bomb Target #1 (MRS01), the Multiple Use Target (MRS02), Bomb Target #2 (MRS03), the Rifle Range (MRS04), and the Gunnery Range (MRS05).

1.1.2 The Department of Defense (DoD) established the Military Munitions Response Program (MMRP) to address DoD sites suspected of containing munitions and explosives of concern (MEC) or munitions constituents (MC). Under the MMRP, the USACE is conducting environmental response activities at FUDS for the Army, the DoD's Executive Agent for the FUDS program.

1.1.3 Pursuant to the USACE's Engineer Regulation (ER) 200-3-1 (USACE 2004a) and the *Management Guidance for the Defense Environmental Restoration Program* (DERP) (Office of the Deputy Under Secretary of Defense [Installations and Environment] 2001), USACE is conducting FUDS response activities. All work is performed in accordance with the following:

- The DERP statute (10 U.S. Code [USC] 2701, *et seq.*);
- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC §9601, *et seq.*);
- Executive Orders 12580 and 13016; and
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300).

1.1.4 USACE is conducting SIs, as set forth in the NCP, to evaluate hazardous substance releases or threatened releases from eligible FUDS.

1.1.5 While not all MEC/MC constitute CERCLA hazardous substances, pollutants, or contaminants, the DERP statute provides the DoD with the authority to respond to releases of MEC/MC. DoD policy states that such responses shall be conducted in accordance with CERCLA and the NCP.

1.1.6 This report summarizes the work performed during the SI and presents an accounting of any MEC and MC contamination identified at Hammond Bombing and Gunnery Range. The SI is limited exclusively to MEC and MC contamination issues and does not consider other unrelated hazardous and toxic waste concerns. Per ER 200-3-1 guidance for conducting an SI, "The SI is not intended as a full-scale study of the nature and extent of contamination or explosive hazards" and requires the collection of a sufficient and appropriate amount of information to determine whether response action is warranted.

1.2 PROJECT OBJECTIVES

The primary objective of the MMRP SI was to determine whether a FUDS project warrants a further response action under CERCLA. The SI collects sufficient and appropriate information necessary to make this determination, as well as:

- Determines the potential need for a removal action;
- Collects or develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (USEPA); and
- Collects data, as appropriate, to characterize the release for effective and rapid initiation of a remedial investigation and feasibility study (RI/FS), as appropriate.

An additional objective of the MMRP SI was to collect additional data necessary to complete the Munitions Response Site Prioritization Protocol (MRSPP).

1.3 PROJECT SCOPE

1.3.1 The primary project planning documents used to perform the SI included the Final Site-Specific Work Plan (SS-WP) Addendum for Hammond Bombing and Gunnery Range (Parsons 2008a), the USACE South Pacific Division Range Support Center Programmatic Work Plan (PWP) (USACE 2005a), the Programmatic Sampling and Analysis Plan (PSAP) (USACE 2005b), and the PSAP Addendum (Parsons 2006). The performance work statement for this project is in Appendix A.

1.3.2 The Final SS-WP Addendum for Hammond Bombing and Gunnery Range was developed based on the SI technical approach agreed to at the February 14, 2008 Technical Project Planning (TPP) Meeting, which included representatives of USACE Fort Worth District (CESWF), USACE Albuquerque District (CESPA), the Louisiana Department on Environmental Quality (LDEQ), local landowners, Tangipahoa Sheriff's Department, and Parsons. The Final TPP Memorandum (Parsons 2008b) and Final SS-WP Addendum (Parsons 2008a) presented the scope for the Hammond Bombing and Gunnery Range SI, which in general, included:

- Collecting six multi-incremental surface soil samples (including one triplicate) within the Hammond Bombing and Gunnery Range MRSs, collecting one multi-incremental surface soil sample within/near an AOI (area of potential cratering), and collecting one ambient multi-incremental surface soil sample in a background area and analyzing all samples for explosives and metals (aluminum,

antimony, chromium, copper, lead, and zinc). No groundwater samples were planned for the site during the TPP meeting, based on landowner information that no wells are present onsite. Subsequently, well data showed that numerous wells are present in the vicinity of the site, including several within the site area; therefore, three groundwater samples were added to the planned sampling activities, dependent on the availability of access to onsite wells.

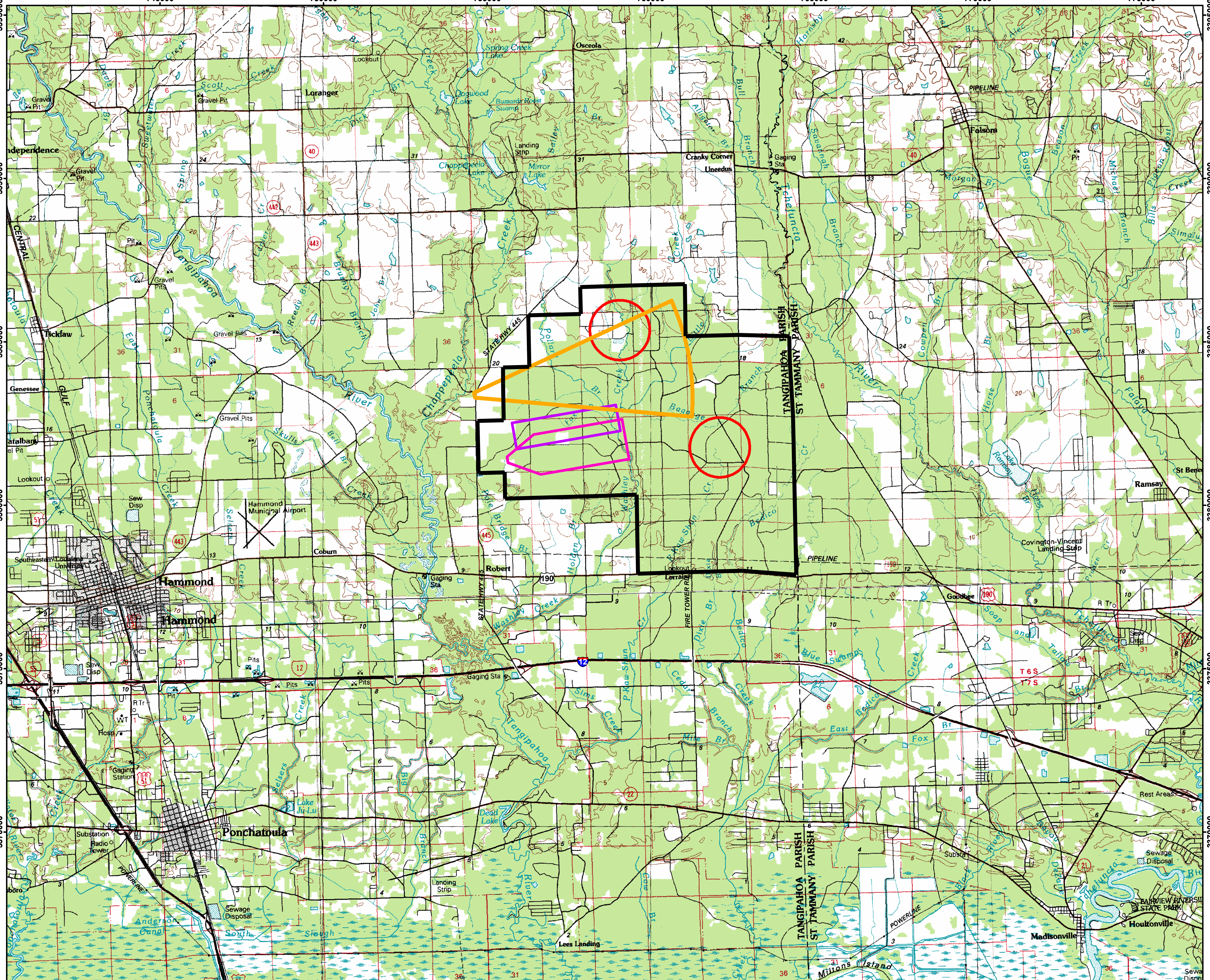
- Conducting approximately 19.1 miles of qualitative reconnaissance (QR) in a meandering path within the site MRSs and remaining land areas.
- Conducting a human health screening level risk assessment (SLRA) for soil by comparing surface soil sample analytical results to the Risk Evaluation/Corrective Action Program (RECAP) soil to groundwater criteria. Groundwater will also be compared to RECAP criteria.
- Conducting a screening level ecological risk assessment (SLERA) if the site is determined to be an important ecological place.

Figure 1.1

Site Location

Hammond Bombing Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary

Site Location in Louisiana

N

Image Source: USGS Topos, 1983
Projection: UTM Zone 15 NAD83, Map Units in Meters

Miles
2 1 0 2

PARSONS	U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER	
DESIGNED BY: BT	Site Location	
DRAWN BY: BT		
CHECKED BY: JB	SCALE: As Shown	PROJECT NUMBER: 744653.84115
SUBMITTED BY: DS	DATE: June 2009	PAGE NUMBER: 1-4
	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig1_1.mxd	

CHAPTER 2
PROPERTY DESCRIPTION AND HISTORY

2.1 SITE DESCRIPTION

2.1.1 The 15,215.9-acre property formerly known as Hammond Bombing and Gunnery Range is located in Tangipahoa Parish, approximately five miles east of Hammond, Louisiana, along U.S. Highway 190. The location and boundaries of the site are shown in Figure 2.1.

2.1.2 Hammond Bombing and Gunnery Range was constructed to provide gunnery, rocket, and bombing practice for pilots deploying overseas. The specific dates of use of the range were from August 1942 to September 1945. As documented in the Hammond Bombing and Gunnery Range Inventory Project Report (INPR) (USACE 1996), Hammond Bombing and Gunnery Range Archives Search Report (ASR) (USACE 2003), and Hammond Bombing and Gunnery Range ASR Supplement (USACE 2004b), the munitions used at Hammond Bombing and Gunnery Range include AN-M30 100-lb. general purpose bombs, MK I 100-lb. general purpose bombs, M38A2 100-lb. practice bombs, M85 100-lb. concrete practice bombs, M5 2.25-inch practice rockets, M1A1/M3/M5 spotting charges, 0.50-caliber machine gun ammunition, AN-MK4 3-lb. practice bombs, AN-MK5 3-lb. practice bombs, AN-MK23 3-lb. practice bombs, AN-MK43 4.5-lb. practice bombs, and general small arms ammunition.

2.1.3 Hammond Bombing and Gunnery Range was returned to the previous owners after its military use. Today, the majority of the land is managed as lumber production land and hunting clubs, and access is very limited due to swampy conditions. The land along the boundary of the site is used for private residences and small business properties. Future land use at this site is expected to remain the same.

2.2 SITE LOCATION AND SETTING

2.2.1 Topography and Vegetation

2.2.1.1 Topography at the Hammond Bombing and Gunnery Range site is nearly level, with an elevation of approximately 35 feet asl. Elevation varies no more than fifteen feet at the site. The site is located within the Upland Sub-Basin of the Pontchartrain Basin. The Tangipahoa River, west of the site, and several small creeks and bayous that flow southward into Lake Pontchartrain, provide drainage for the site.

2.2.1.2 During the wet season, the site has considerable standing water. During the SI QR in August, the site was very wet, with standing water present across most of the central, southern, and eastern portions of the site, including roads. Several of the roads into the site were unnavigable due to standing water, even though they were topographically higher than the surrounding land.

2.2.1.3 Very dense vegetation is present at the site, consisting of grasses, shrubs, and trees. The site is partially used for logging.

2.2.2 Soil

2.2.2.1 Soil at Hammond Bombing and Gunnery Range is composed of four basic types. They are the moderately drained Toula-Tangi soil group, the poorly drained Guyton-Abita group, the somewhat poorly drained Stough-Myatt group, and the soil group of the floodplains, the Ouachita-Ochlockonee-Guyton group.

2.2.2.2 The Toula-Tangi group is located on the northern and western portion of the subject site. It is gently sloping to moderately sloping on broad to narrow ridge tops and on side slopes along drainages. Elevations range from about 60 to 240 feet above sea level (asl). Slopes range from 1 to 3 percent on ridge tops to 8 percent on side slopes. The Toula soil is dark grayish brown silt loam on the surface and the subsoil is light yellowish brown and is a compact and brittle fragipan. The Tangi soil is very gently sloping to moderately sloping. The surface layer is dark grayish brown silt loam with yellowish brown silt loam subsoil. The lower portion of the subsoil is a fragipan of mottled yellowish brown, yellowish red, clay loam and clay. This group is well-suited to woodlands and moderately suited to urban and recreational uses.

2.2.2.3 Like the Toula-Tangi group, the Guyton-Abita group are gently sloping to moderately sloping on broad to narrow ridge tops. Located on the southwest portion of the subject site, this soil has elevations ranging from 5 feet to 60 feet asl. Slopes are 0 to 1 percent on the flats and 0 to 5 percent in depressional areas. The Guyton soil is brown or dark grayish brown silt loam. The subsurface layer is mottled grayish brown, gray, and light brownish gray silt loam. The Abita soil is somewhat poorly drained on broad slightly convex ridges and on side slopes along drainage ways. The surface layer is dark grayish brown silt loam with pale brown or light brownish gray silt loam. Soil of this group is suited to use as woodland, pasture, and small acreages for truck crops and home sites.

2.2.2.4 The Stough-Myatt soil group is found on the southern and eastern portion of the subject site. This soil is level, somewhat poorly drained, and loamy throughout. The soil is found on slightly convex ridges and broad flats and in swales and small drainage ways. Elevations range from 20 to 40 feet asl with slopes of 0 to 1 percent. The Stough soil has a dark grayish brown fine sandy loam surface. The subsurface layer is pale brown, mottled, fine sandy loam and the subsoil is light yellowish brown, mottled loam and light brownish gray sandy clay loam. The poorly drained Myatt soil is found on broad flats and in swales and small drainage ways. The surface layer is very dark gray fine sandy loam with a subsurface layer of gray, mottled fine sandy loam. The subsoil is gray and light gray, mottled loam, clay loam, and sandy clay loam. This soil group is well-suited to woodland production; however, flooding is a hazard.

2.2.2.5 The Ouachita-Ochlockonee-Guyton soil group passes north-south through the center of the subject site. The soil of this group is on the floodplains of streams, and is subject to frequent flooding. Elevations range from 5 to 200 feet asl with slopes from 0 to 3 percent.

The Ouachita soil is gently undulating and well-drained with a dark brown silt loam. The subsoil is yellowish brown silt loam. The Ochlockonee soil is gently undulating and well-drained on convex ridges. The surface layer is dark grayish brown sandy loam and the underlying material is stratified yellowish and brownish sandy loam and loamy fine sand. The Guyton soil is level and poorly drained. It is in swales and flats between the ridges. The surface layer is brown or dark grayish brown silt loam. The subsurface layer is mottled grayish brown, gray, and light brownish gray silt loam. Wetness, low fertility, and the hazard of flooding are the main limitations. This soil is moderately well-suited to bottomland hardwoods. The soil is well-suited as habitat for deer, squirrels, rabbits, ducks, turkeys, and other small wildlife.

2.2.3 Climate

2.2.3.1 Hammond Bombing and Gunnery Range is located in southeastern Louisiana, north of the Gulf of Mexico, which provides a strong climatic influence. Winters are mild, with an average temperature of 51 degrees Fahrenheit (ºF). The record winter low temperature was 9ºF, which occurred at Amite on January 12, 1962. Summers are hot, with an average temperature of 81ºF and an average daily maximum temperature of 92ºF. The highest recorded temperature in the area, which occurred on July 1, 1954, is 104ºF.

2.2.3.2 The total annual precipitation is approximately 65 inches. Approximately 55 percent of the annual precipitation occurs from April through September. Thunderstorms occur frequently during the summer. Conversely, snowfall is very rare, with 90 percent of the winters having no accumulation. The heaviest one day snowfall on record was just over 3 inches.

2.2.3.3 The average annual relative humidity in the afternoons is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. Sunshine occurs approximately 70 percent of the time in the summer and approximately 50 percent of the time in the winter. Prevailing southeast winds are the highest in the spring, at about 10 miles per hour.

2.2.4 Significant Structures

No military-related structures were observed at the site or reported by local landowners that were encountered during the SI field effort. Significant structures located within the FUDS boundary are private full-time residences and recreational temporary residences (*e.g.*, hunting trailers). Bomb Target #1 and the remaining land areas of the site have several full-time residences located within them, in addition to businesses. No full-time residences were observed within the Multiple Use Target, Bomb Target #2, Rifle Range or Gunnery Range MRSs, although temporary hunting residences were observed in the Multiple Use Target MRS and remaining land area. An explosives storage and distribution facility is located in the southern portion of the site, at the location of the southernmost groundwater sample location (HBGR-GW-01). In addition, the owner of one of the temporary residences encountered in the Multiple Use Target, at the location of groundwater sample HBGR-GW-GW02, indicated that this was reportedly an area where the military previously operated an explosives storage and handling facility.

2.2.5 Demographics

Hammond Bombing and Gunnery Range is located in Tangipahoa Parish, Louisiana. According to the 2000 U.S. Census data, the total population of the 790.24-square mile parish was 100,588 people, giving the parish a population density of 127.3 persons per square mile (U.S. Census Bureau 2000). Hammond Bombing and Gunnery Range is sparsely inhabited in its central, southern, and eastern portions, but has residential and business developments in its northern and western portions. Population statistics are shown in Table 2.1. Although it is unlikely that more than five permanent residences exist within Bomb Target #2, the Rifle Range, and the Gunnery Range MRSs, more than 26 residences likely exist within the Bomb Target #1 MRS and Multiple Use Target MRS boundaries, as many residences were observed in these MRSs during the SI field activities. Further, there are many more residences and businesses within the FUDS boundary that are outside of MRS areas (remaining land area). Using available population information based on U.S. Census data for the year 2000, the SI assumes that 9,752 people live within 4 miles of the site. Population information was generally determined by including the total number of people indicated in the census data blocks for any blocks (partial or complete) intersected by the 0- to 4-mile buffer zone around the site. The census data blocks are shown in Figure 2.2.

Table 2.1
Population Within 4-Mile Buffer
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

Area	Maximum Population within Buffer Zone							Total
	On Site	0 to ¼ mile	¼ to ½ mile	½ to 1 mile	1 to 2 miles	2 to 3 miles	3 to 4 miles	
Bomb Target #1	90	10	0	359	505	566	1,149	2,679
Multiple Use Target	64	100	134	582	348	1,778	2,609	5,615
Bomb Target #2	0	0	0	2	323	1,458	1,376	3,159
Rifle Range	0	0	64	19	819	1,754	1,594	4,250
Gunnery Range	0	64	0	29	795	2,066	1,307	4,261
Entire Site	332	709	29	1,175	1,960	2,200	3,347	9,752

Source: U.S. Census 2000 data.

2.2.6 Current and Future Land Use

Hammond Bombing and Gunnery Range was returned to the previous owners after its military use. Today, the majority of the land is managed as lumber production land and hunting clubs. This land was owned for many years (until May 2008) by a trust managed by the Bennett-Peters Company. The land is currently owned by the Warren Trust and Marietta Trust. The remaining land is owned by numerous private owners that use the land for

residential and recreational puposes. Public access is primarily unrestricted at the site MRSs. An active explosives storage and distribution facility is located in the southern portion of the site, at the location of the southernmost groundwater sample location (HBGR-GW-01). Future land use at this site is expected to remain the same. According to federal databases and the ASR (USACE 2003), there are no recorded cultural or archaeological resources within Hammond Bombing and Gunnery Range.

2.3 SITE OWNERSHIP AND HISTORY

2.3.1 USACE leased 15,215.9 acres of land from 20 different individuals and corporations in 1942 for use as a bombing and gunnery range. The site area was chosen due to its proximity to numerous training airfields and low population density. The land is located in eastern Tangipahoa Parish and historical documents note that the military used the property from August 1942 to September 1945 (USACE 2003).

2.3.2 In March 1943, Hammond Army Airfield (AAF) was commissioned as a sub-base of Harding AAF. Upon completion of Hammond AAF, aircraft units were transferred to the airfield temporarily for their bombing and gunnery training phase. At one point, Hammond AAF and its range complex, Hammond Bombing and Gunnery Range, was a sub-base of Harding AAF, Gulf Port AAF, Key Field, Stuttgart AAF, and Esler AAF.

2.3.3 During May 1942, Gulf Port AAF began use of Hammond AAF for high-level bombardment training (Ford 1996). Some of this training reportedly involved use of large high explosive (HE) bombs that caused large enough explosions to rattle windows in downtown Hammond (Ford 1996).

2.3.4 As 1945 drew to a close, General Order No. 131, dated 7 September 1945, formally closed the former Hammond Bombing and Gunnery Range with an effective date of 10 September 1945. Airfield operations at the Hammond AAF were officially discontinued on 15 September 1945. Base personnel performed a walkover of Hammond Bombing and Gunnery Range in an attempt to remove all ordnance items.

2.3.5 As stated previously, Hammond Bombing and Gunnery Range was returned to the previous owners after its military use. Local Deputy Sheriff Davidson has indicated that he has responded to several ordnance findings by local residents since the site closure, although these findings were not well documented. Local residents that were present during the SI and spoke to the SI field team had no personal ordnance encounters and did not know of other residents that had. According to John King, Legal Representative for Warren Trust and Marietta Trust, the site has been plowed, planted, occupied, worked on, and otherwise traversed for over 64 years without any sightings of or incidents relating to buried unexploded ordnance.

2.3.6 During the April 2002 site visit in support of the ASR, members of USACE examined Hammond Bombing and Gunnery Range for ordnance-related features and items. The site visit team noted HE cratering and fragments of HE bombs at MRS01 (Bomb Target #1) and MRS03 (Bomb Target #2). The site visit team also noted numerous practice bomb fragments of unknown type, M38A2 100-lb. practice bombs, tail fins, suspension lug

bands, parts of M1A1 spotting charges, 0.30-caliber projectiles, and 0.50-caliber projectiles at the site.

2.4 SITE OPERATIONS AND WASTE CHARACTERISTICS

2.4.1 Munitions Response Site-Specific Description and Operations

Hammond Bombing and Gunnery Range contains five MRSs, comprising approximately 6,045 acres in land area. The site boundary and MRS boundaries are shown on Figure 2.1. The five MRSs are referred to as Bomb Target #1, the Multiple Use Target, Bomb Target #2, the Rifle Range, and the Gunnery Range (Table 2.2). According to the ASR Supplement, the risk assessment code (RAC) score for the Bomb Target #1, Multiple Use Target, and Bomb Target #2 MRSs is a "4", while the RAC score for the Rifle Range and Gunnery Range is a "5" (USACE 2004b). Scores of "1" and "5" indicate the highest and lowest hazard potentials, respectively.

Table 2.2
Munitions Response Site Summary Table
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

MRS	Total MRS Acreage	Description (from USACE 2003/2004b)	ASR Supplement RAC Score
Bomb Target #1	649	Circular target located in the extreme northern portion of Hammond Bombing and Gunnery Range. Munitions used at this MRS include AN-M30 100-lb. general purpose bombs and MK I 100-lb. general purpose bombs.	4
Multiple Use Target	3,108	Wedge-shaped target that originates just outside the western edge of the FUDS boundary and travels eastward through the central and northern portions of Hammond Bombing and Gunnery Range. Munitions used at this MRS include M38A2 100-lb. practice bombs, M85 100-lb. concrete practice bombs, M5 2.25-inch practice rockets, M1A1/M3/M5 spotting charges, 0.50-caliber machine gun ammunition, and general small arms ammunition.	4
Bomb Target #2	649	Circular target located in the eastern central portion of Hammond Bombing and Gunnery Range. Munitions used at this MRS include M38A2 100-lb. practice bombs, AN-MK4 3-lb. practice bombs, AN-MK5 3-lb. practice bombs, AN-MK23 3-lb. practice bombs, AN-MK43 4.5-lb. practice bombs, and M1A1/M3/M5 spotting charges.	4
Rifle Range	999	Rectangular-shaped range located in the eastern portion of Hammond Bombing and Gunnery Range, partially overlapping the southern portion of the Gunnery Range MRS. Munitions used at this MRS include general small arms ammunition.	5
Gunnery Range	640	Rectangular-shaped range located in the eastern portion of Hammond Bombing and Gunnery Range, partially overlapping the northern portion of the Rifle Range MRS. Munitions used at this MRS include 0.50-caliber machine gun ammunition and general small arms ammunition.	5

2.4.2 Regulatory Compliance

The USACE is conducting the SI at Hammond Bombing and Gunnery Range as part of FUDS response activities pursuant to and in accordance with the guidance, regulations, and legislation listed in Subchapter 1.1.3.

2.5 PREVIOUS INVESTIGATIONS

2.5.1 1996 Inventory Project Report

The 1996 INPR (USACE 1996) for Hammond Bombing and Gunnery Range, prepared by USACE, New Orleans District, identified Hammond Bombing and Gunnery Range as a FUDS property and assigned a RAC score of 2. The INPR determined that Hammond Bombing and Gunnery Range was formerly used by the Department of War/DoD and recommended a site evaluation for possible ordnance contamination.

2.5.2 2003 Archives Search Report

2.5.2.1 The Hammond Bombing and Gunnery Range ASR was completed by USACE, Rock Island District, in March 2003 (USACE 2003). The ASR documented the results of the 2002 site visit, records search, aerial photograph review, and a RAC score of "3."

2.5.2.2 The ASR for Hammond Bombing and Gunnery Range indicated that, during the 2002 site visit, there were several ordnance-related findings and remaining target features. The site visit team noted HE cratering and fragments of HE bombs at Bomb Target #1 and Bomb Target #2. The site visit team also noted M38A2 100-lb. practice bombs (Multiple Use Target), parts of M1A1 spotting charges (Multiple Use Target), 0.30-caliber projectiles (Rifle Range), and 0.50-caliber projectiles (Multiple Use Target) at the site. The team also learned that no MEC incidents had been reported at the former ranges or targets.

2.5.2.3 According to the ASR, the ordnance types used at Hammond Bombing and Gunnery Range included:

- Bomb, 100-lb., General Purpose, AN-M30,
- Bomb, 100-lb., General Purpose, MK 1,
- Bomb, 100-lb., practice, M38A2,
- Bomb, 3-lb., practice, AN-MK4,
- Bomb, 3-lb., practice, AN-MK5,
- Bomb, 3-lb., practice, AN-MK23,
- Bomb, 4.5-lb., practice, AN-MK43,
- Rocket, 2.25-inch, practice, M5,
- Signal, Spotting Charge, M1A1,
- Small arms ammunition, 0.50-caliber, machinegun, and
- General small arms ammunition, 0.30-caliber, machinegun.

2.5.3 2004 Archives Search Report Supplement

2.5.3.1 The Hammond Bombing and Gunnery Range ASR Supplement was completed by USACE, St. Louis District, in November 2004 (USACE 2004b). It presents information concerning the potential presence of MD at Hammond Bombing and Gunnery Range that was reported in the 2003 ASR.

2.5.3.2 The ASR Supplement identified five MRSs at Hammond Bombing and Gunnery Range: Bomb Target #1 (RAC score of 4), the Multiple Use Target (RAC score of 4), Bomb Target #2 (RAC score of 4), the Rifle Range (RAC score of 5), and the Gunnery Range (RAC score of 5).

2.5.3.3 According to the ASR Supplement, the ordnance types used at Hammond Bombing and Gunnery Range are mostly consistent with those listed in the ASR:

- Bomb, 100-lb., General Purpose, AN-M30,
- Bomb, 100-lb., General Purpose, MK 1,
- Small arms ammunition, 0.50-caliber, machinegun,
- General small arms ammunition, 0.30-caliber, machinegun,
- Signal, Spotting Charge, M1A1,
- Bomb, 100-lb., practice, M85,
- Bomb, 100-lb., practice, M38A2,
- Bomb, 3-lb., practice, AN-MK4,
- Bomb, 3-lb., practice, AN-MK5,
- Bomb, 3-lb., practice, AN-MK23, and
- Bomb, 4.5-lb., practice, AN-MK43.

2.5.4 2007 Annual Report to Congress

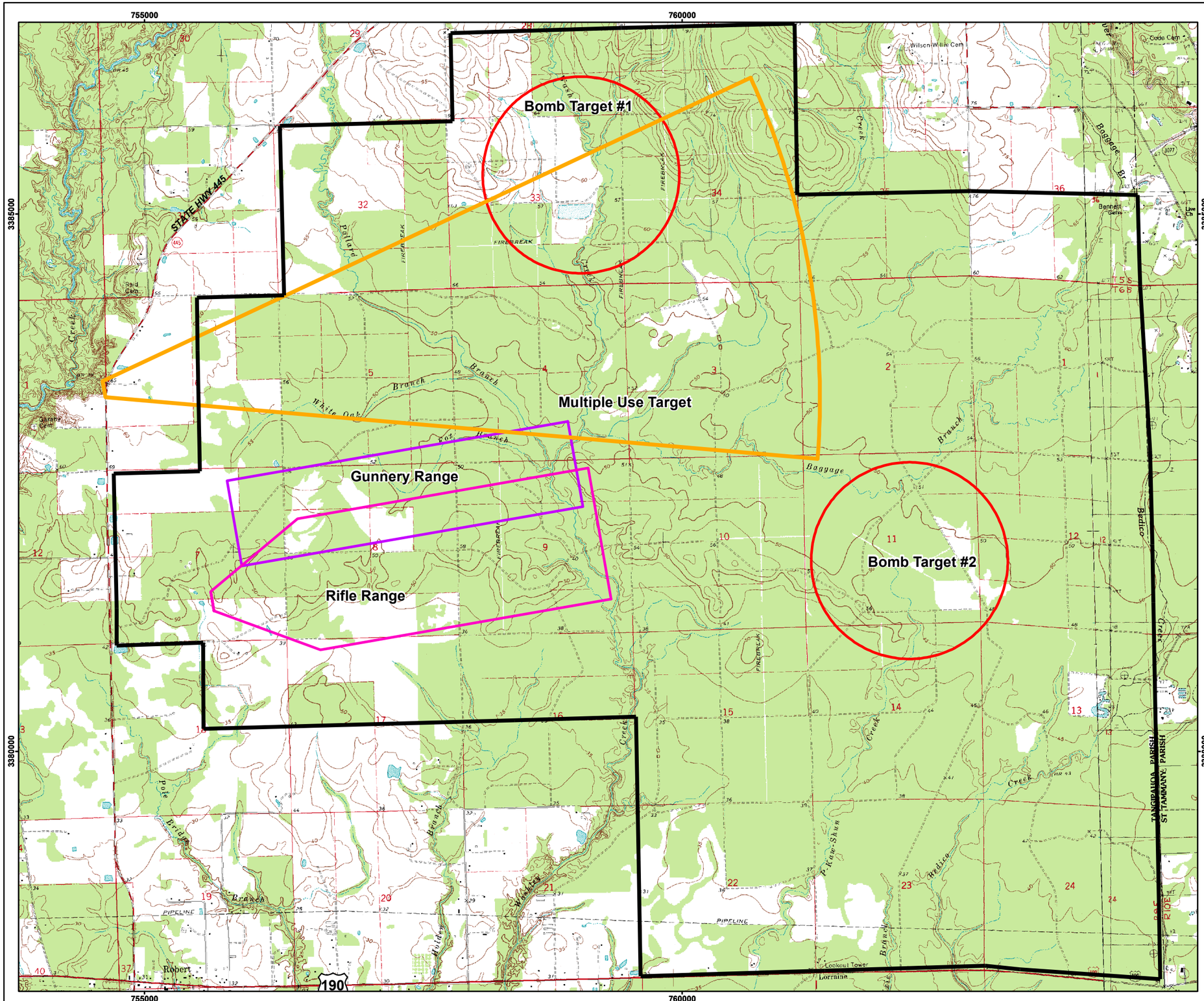
The Annual Report to Congress (DEP 2008) indicates Hammond Bombing and Gunnery Range consists of 6,045 acres, which is consistent with the cumulative MRS acreages reported in the ASR Supplement. Unlike the ASR Supplement, a RAC score of "3" is listed for the site.

Figure 2.1

Site Setting

Hammond Bombing and Gunnery Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary

Site Location in Louisiana

N

Image Source: USGS 7.5' Topo Quadrangles, 1992 - 1993
Projection: UTM Zone 15 NAD83, Map Units in Meters

3,000 1,500 0 3,000 Feet

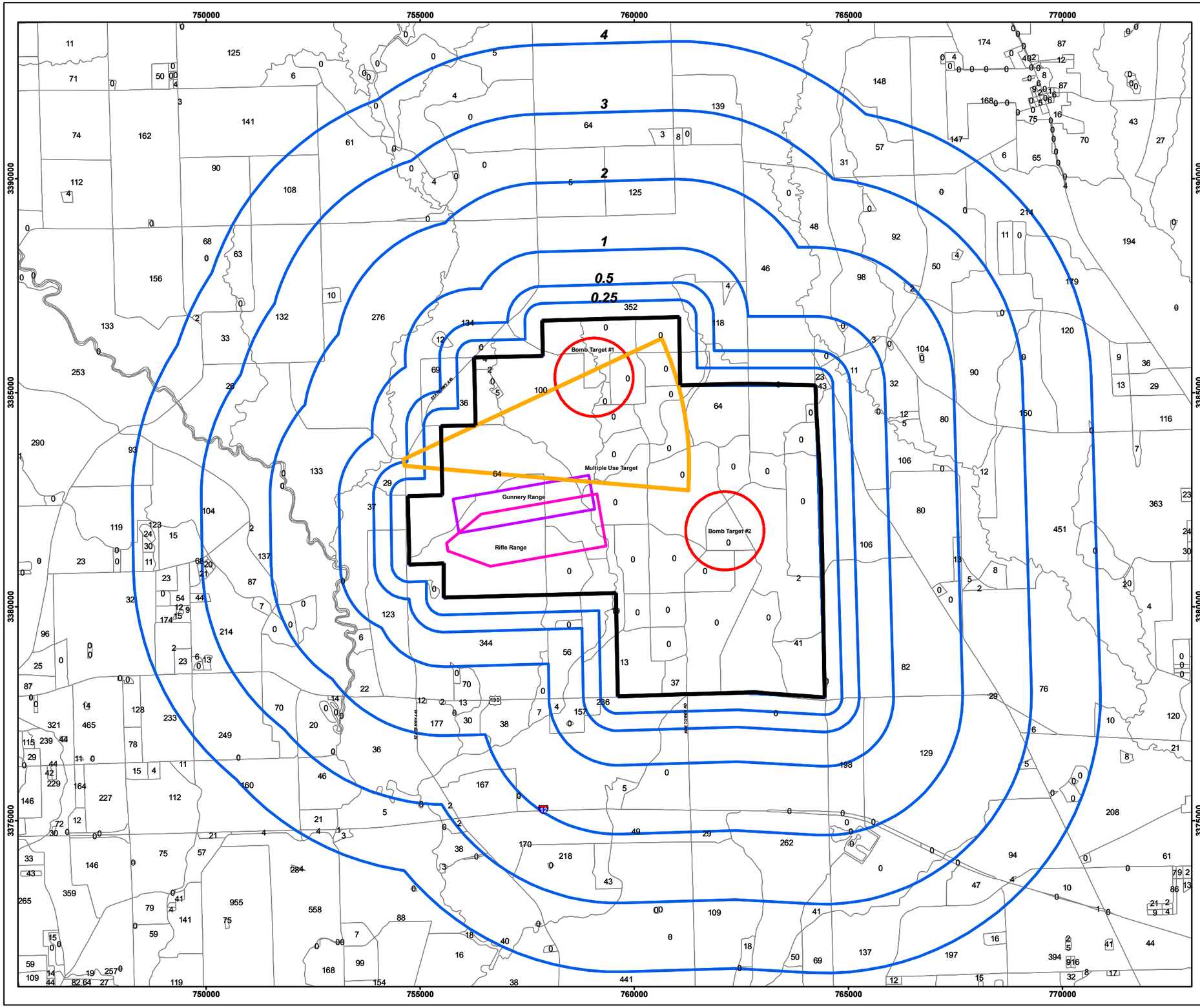
PARSONS	U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	**Site Setting**		
DRAWN BY: BT	SCALE: As Shown	PROJECT NUMBER: 744653.84115	
CHECKED BY: JB	DATE: June 2009	PAGE NUMBER: 2-10	
SUBMITTED BY: DS	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig2_1.mxd		

Figure 2.2

2000 Census Data
Hammond Bombing and Gunnery Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- 4 — 2000 Census Block Boundary with Total Population
- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary
- Buffer (Mile)

Site Location in Louisiana

N

Projection: UTM Zone 15 NAD83, Map Units in Meters

2 1 0 2 Miles

PARSONS

U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	2000 Census Data		
DRAWN BY: BT		SCALE: As Shown	PROJECT NUMBER: 744653.84115
CHECKED BY: JB		DATE: June 2009	PAGE NUMBER: 2-11
SUBMITTED BY: DS		FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig2_2.mxd	

CHAPTER 3
SITE INSPECTION TASKS

3.1 HISTORICAL RECORD REVIEW

Parsons performed a document review for Hammond Bombing and Gunnery Range. Documents reviewed included the 1996 INPR (USACE 1996), the 2003 ASR (USACE 2003), the 2004 ASR Supplement (USACE 2004b), and Hammond Army Airfield and Early Aviation in the Hammond Area (Ford 1996).

3.2 TECHNICAL PROJECT PLANNING

Hammond Bombing and Gunnery Range falls under the purview of CESWF. A TPP meeting was facilitated by CESWF on February 14, 2008 and included representatives of CESWF, CESPA, LDEQ, local landowners, Tangipahoa Parish Sheriff's Department, and Parsons. The TPP Team concurred with the Technical Approach presented in the Final TPP Memorandum (Parsons 2008a) issued on May 15, 2008 (see Appendix B). The sampling rationale is included in Table 3.1. Key TPP facts and decisions are summarized below:

- QR would be conducted throughout the MRSs to look for evidence of past DoD use.

- The TPP Team agreed to conduct MC sampling at Hammond Bombing and Gunnery Range using the "multi-incremental sampling" (MIS) method. The MIS method defines one or more "decision units" (DU) to be sampled within the MRS, from which multiple "sample increments" are then collected and composited into a single, representative "multi-incremental sample" for each DU.

- During the TPP meeting, Deputy Sheriff Tom Davidson, of Tangipahoa Parish, identified locations on the map where he recalled seeing range features. He identified a "rifle range berm area" in the Rifle Range MRS, "strafing targets" and a "demolition area" in the Gunnery Range MRS, a "rocket area" in the Multiple Use Target MRS, and an "area of potential cratering" north of the Bomb Target #2 MRS. Because the "area of potential cratering" was outside the MRS boundaries, it was identified as an AOI. Sheriff Davidson also indicated that the Multiple Use target was also actually about 4,500 feet south of the location shown in the ASR and ASR Supplement. The locations of these areas are shown in Figure 3.1.

- It was agreed there would be eight DUs and eight multi-incremental samples collected within Hammond Bombing and Gunnery Range, six within the Hammond Bombing and Gunnery Range MRSs, one within/near an AOI (area of potential cratering), and one ambient sample in a background area. The DUs for the samples located within MRSs or areas that ordnance-related items have been found would be 50 meters by 50 meters (with 50 sampling increments) and the samples would analyzed for explosives, aluminum, antimony, chromium, copper, lead, and zinc. If no target features or

ordnance-related findings can be identified at these locations, the DUs would be expanded to 100 meters by 100 meters with 100 sampling increments (samples will be analyzed for the same analytes mentioned above). The remaining land sample DU would be 10 meters by 10 meters with 30 sampling increments. It was agreed that dense vegetation may alter DU sizes, but the areas would be maintained as much as possible. Sample depth would be 0 to 2 inches for all sample increments.

- Method SW8330B, which has been approved by USEPA for explosives analysis, would be used. Any detection of explosives would constitute a release.

- The TPP Team agreed there would be no groundwater, sediment, or surface water samples collected. Subsequently, well data showed that numerous wells are present in the vicinity of the site, including several within the site area; therefore, three groundwater samples were added to the planned sampling activities, dependent on the availability of access to onsite wells.

- To determine if there has been an MC release, metals would be compared to three times background. Background (ambient) metals comparison criteria would be three times the United States Geological Survey (USGS) criteria for Tangipahoa Parish. For those metals that do not have USGS criteria, the remaining land (ambient) results would be used for background comparison criteria.

- For the human health SLRA, metals that exceed three times background, explosives results, and perchlorate results would be compared to residential RECAP soil to groundwater criteria.

- At the TPP meeting, based on landowner feedback, it was agreed that it is not likely that Hammond Bombing and Gunnery Range will be considered an "important ecological place." Subsequently, it was determined that wetlands very likely exist within the site boundary; therefore, the site is considered an important ecological place.

3.3 SECOND TPP MEETING

A second TPP meeting was conducted on January 22, 2009 to discuss the conclusions and recommendations of the draft final version of this SI Report that was issued by USACE on December 12, 2008. This second TPP meeting was facilitated by CESWF and included representatives from USACE, LDEQ, Parsons, and The Warren Trust and The Marietta Trust. The TPP Memorandum prepared for the second meeting is included in Appendix B.

3.4 NON-MEASUREMENT DATA COLLECTION

A well search was performed by Banks Information Solutions to find information about groundwater wells within and near the site (Banks Information Solutions 2008 [Appendix L]). In addition to the INPR, ASR, and ASR Supplement described previously, the following printed and electronic information sources were consulted as part of the Hammond Bombing and Gunnery Range SI:

- Threatened and Endangered Species System Listings by State (United States Fish and Wildlife Service [USFWS] 2008a);
- Topographic map (USGS 1983);
- United States Census 2000 American FactFinder (U.S. Census Bureau 2000);
- Water Well Report, Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana (Banks Information Solutions 2008); and
- Wetlands Online Mapper, National Wetlands Inventory (USFWS 2008b).

3.5 SITE-SPECIFIC WORK PLAN

3.4.1 The SS-WP (Parsons 2008a) augments the PWP and PSAP, as warranted, to present pertinent site-specific information and procedural adjustments that could not be readily captured in the programmatic documents or that resulted from TPP Team agreements that required modifying the preliminary SI technical approach.

3.4.2 The PWP and PSAP are intended to be umbrella documents that set overall programmatic objectives and approaches, whereas the SS-WP provides site-specific details and action plans. The PWP, PSAP, and SS-WP were taken to the site for reference by the field team during SI field activities.

3.4.3 The SS-WP includes the project description, the field investigation plan, the sampling and analysis plan, the environmental protection plan, and the health and safety plan specific to Hammond Bombing and Gunnery Range. The field investigation plan developed a technical approach to guide sample collection and analysis for MEC and MC to ensure that results were sufficient to determine whether additional investigations or implementation of a remedy are necessary for the site. Key elements of the technical approach include the conceptual site model (CSM) to help determine types of samples and their locations, data quality objectives (DQO) to ensure the data acquired are sufficient to characterize MEC and MC at the site, and QR to confirm presumed target locations and evaluate the presence or absence of MEC/MC.

3.4.4 The sampling and analysis plan discusses procedures for sample collection from locations biased toward the highest potential for MEC contamination; quality control (QC); sample shipment to an approved, independent laboratory; and analysis of the samples by the laboratory. The environmental protection plan evaluates compliance with Army Regulation 200-2 by presenting procedures for avoiding, minimizing, and mitigating potential impacts to environmental and cultural resources during site field activities. The accident prevention plan supplements the programmatic accident prevention plan with site-specific emergency contact information and directions to the nearest hospital.

3.6 DEPARTURES FROM PLANNING DOCUMENTS

3.5.1 Hammond Bombing and Gunnery Range was sampled in accordance with the SS-WP with the following deviations:

- The SS-WP indicated that 19.1 miles of QR would be conducted; however, 22.4 miles of QR was conducted. The QR path was modified due to very dense vegetation and the presence of standing water/swampy areas over large portions of the site.
- Although no target features or ordnance-related findings were identified at six of the seven DUs within the site MRSs, DU dimensions were maintained at 50m x 50m with 50 sampling increments (rather than increasing to 100m x 100m with 100 sampling increments) as the dense vegetation and standing water over most of the site prevented the ability to reasonably collect larger DUs at these locations.
- DU locations were moved slightly to avoid areas with standing water. DU6 was moved to a location where 0.50-caliber MD was found.

3.5.2 No other departures from planning documents occurred for sample collection or QR at this site.

Table 3.1
Sampling Rationale
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

Sample ID	Sample Coordinates		Media	Analysis	Munitions	Rationale
	Longitude	Latitude				
HBGR-MRS01-DU1-SS-02-01	90.26655669340	30.54480161630	Surface soil	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, and Zinc	AN-M30 General Purpose Bomb, 100 lb 100-lb. Bomb, General Purpose, MK I	MIS located at center of Bomb Target #1 MRS.
HBGR-MRS02-DU2-SS-02-01	90.33123623280	30.54451034250	Surface soil	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, and Zinc	AN MK 5, AN MK 23, AN-MK 43 M38A2 Practice Bomb, 100 lb M1A1 Spotting Charge	MIS located at center of Bomb Target #2 MRS.
HBGR-MRS03-DU3-SS-02-01	90.33020842750	30.54067848610	Surface soil	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, and Zinc	General small arms 0.50-caliber Machine Gun M85 Practice Bomb M1A1 Spotting Charge	MIS located within Multiple Use Target MRS, at identified “rocket area.”
HBGR-MRS04-DU4-SS-02-01	90.30303602860	30.54823955400	Surface soil	Explosives, Antimony, Copper, and Lead	General small arms	MIS located just south of berm area within Rifle Range MRS.
HBGR-MRS05-DU5-SS-02-01	90.28859679060	30.56043640790	Surface soil	Explosives, Antimony, Copper, and Lead	General small arms 0.50-caliber Machine Gun	MIS located in strafing target area within Gunnery Range MRS.
HBGR-MRS05-DU6-SS-02-01	90.26511278180	30.55739049380	Surface soil	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, and Zinc	General small arms 0.50-caliber Machine Gun	MIS located just north of Gunnery Range MRS, at location of observed 0.50-caliber projectile.
HBGR-AOC-DU7- SS-02-01	90.28922286860	30.51888811420	Surface soil	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, and Zinc	NA	MIS located in area of potential cratering AOI and noted location of previously discovered live items.
HBGR-RL-DU8-SS-02-01	90.29924800000	30.57123400000	Surface soil	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, and Zinc	NA	MIS located outside MRSs, in remaining land area (used as ambient concentration sample).
HBGR-GW-01	TBD	TBD	Groundwater	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, Zinc, and Perchlorate	NA	Sample to evaluate available water sources to support SI recommendation.
HBGR-GW-02	TBD	TBD	Groundwater	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, Zinc, and Perchlorate	NA	Sample to evaluate available water sources to support SI recommendation.
HBGR-GW-03	TBD	TBD	Groundwater	Explosives, Aluminum, Antimony, Copper, Chromium, Lead, Zinc, and Perchlorate	NA	Sample to evaluate available water sources to support SI recommendation.

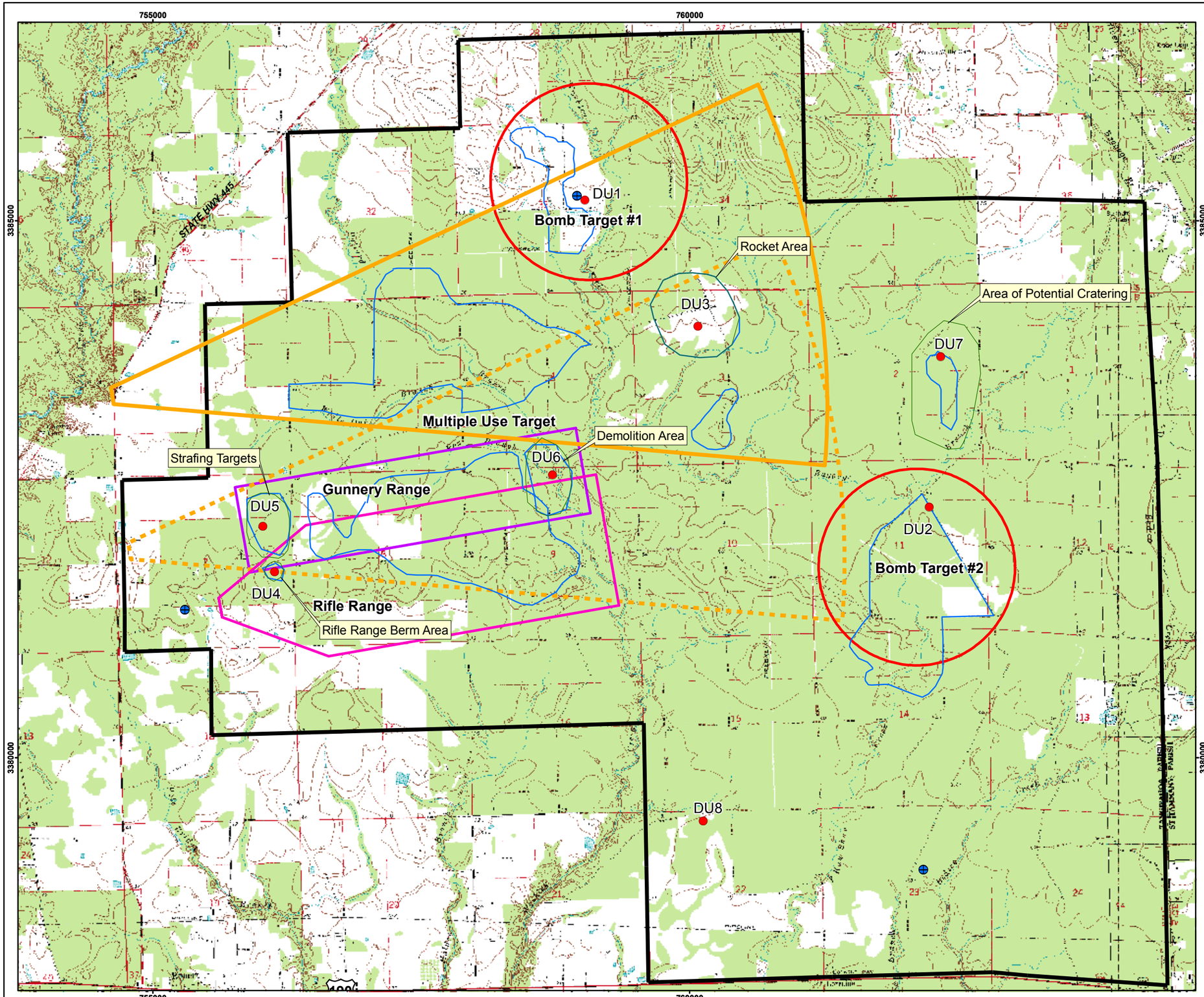
HBGR = Hammond Bombing and Gunnery Range
DU = Decision Unit
MIS = Multi-Incremental Sample
AOC = Area of potential Cratering; Live Item Demo by Sheriff
RL = Remaining Land
NA = Not applicable

Figure 3.1

Proposed Qualitative Reconnaissance and Sample Locations

Hammond Bombing and Gunnery Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Surface Soil Sample Location (Decision Unit)
- Groundwater Well
- Representative Qualitative Reconnaissance Track
- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary
- Suspected Location of Multiple Use Target Based on Stakeholder Information
- Area of Potential Cratering AOI

Site Location in Louisiana

N

Image Source: USGS Topos, 1983
Projection: UTM Zone 15 NAD83, Map Units in Meters

3,000 1,500 0 3,000 Feet

PARSONS	U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	**Proposed Qualitative Reconnaissance and Sample Locations**		
DRAWN BY: BT	SCALE: As Shown	PROJECT NUMBER: 744653.84115	
CHECKED BY: JB	DATE: June 2009	PAGE NUMBER: 3-6	
SUBMITTED BY: DS	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig3_1.mxd		

CHAPTER 4
MUNITIONS AND EXPLOSIVES OF CONCERN FINDINGS

4.1 GENERAL INFORMATION

4.1.1 Qualitative Reconnaissance

4.1.1.1 As stated previously, the primary task of the SI was to assess the presence of MEC, MD, or MC. To assess the presence of MEC, the field team conducted QR by walking approximately 22.4 miles at Hammond Bombing and Gunnery Range between August 4th and 7th, 2008.

4.1.1.2 Site QR consisted of visual reconnaissance of the site surface to provide an indication of the presence of potential subsurface anomalies, and the identification of visual indicators of suspect areas, including ground scars or craters, earthen berms, bunker/target remnants, visible metallic debris, distressed vegetation, and stained soil. QR activities focused within the MRSs, as they are most likely to contain MEC contamination.

4.1.1.3 Team members walked to the sampling locations, made field observations, collected surface soil and groundwater samples, and followed the QR paths shown on Figure 4.1. Surface soil and groundwater sampling results are presented in Chapter 5.

4.1.1.4 As discussed in the SS-WP, the QR route was not limited to the proposed path but was determined in the field based on field conditions by the field team leader according to baseline QC procedures described in Chapter 3 of the PWP, visual observations, and areas of predetermined focus (Parsons 2008a). Table 4.1 presents the potential munitions anticipated to be present at the site based on the INPR, ASR, and ASR Supplement. The MEC CSM is included in Appendix J.

4.1.1.5 As shown in Appendix E (Photodocumentation Log), the field team noted 66 discrete field observations throughout the course of the SI, including details on the topography, soil color, drainage, and the presence of any barriers. There were two observations related to MEC and MD (0.50-caliber projectile MD items at observations 9 and 13), as summarized in Table 4.2 and shown on Figure 4.1. No indications of past DoD use were observed at the other observation locations. No evidence of targets, berms, or craters were observed. Appendix D includes the related field forms from the field team.

Table 4.1
Chemical Composition of Potential Munitions Constituents
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

General Munition Type	Type/Model	Case Composition	Filler	Potential MC	Selected MC Analytes
Cartridge, 22 caliber, Small Arms	General	Brass, steel, aluminum	Smokeless powder, primer mix	***Lead***, antimony, tetrazene, ***nitrocellulose****, ***copper****, ***nitroglycerin****, iron, dinitrotoluene, diphenylamine, barium, potassium nitrate, PETN (pentaerythritol tetranitrate) , z***inc****	Lead, copper, zinc, explosives
Cartridge, .30 Caliber	M2 Ball M1 Tracer M2 Armor Piercing M1 Ball M16 Tracer	Brass, Steel, Aluminum	Lead antimony Single- or double-base powder Primer Composition Tracer Composition	***Lead, antimony***, barium nitrate, barium peroxide, ***copper,*** zinc, ***nitrocellulose****, iron, lead azide, lead thiocyanate, potassium chlorate, PETN (Pentaerythritol Tetranitrate), aluminum, magnesium, ***nitroglycerin****, nickel, ***dinitrotoluene*, *diphenylamine****, zinc	Lead, antimony, copper, explosives
Cartridge, 45 caliber, Small Arms	General	Brass, steel, aluminum	Smokeless powder, primer mix	***Lead,*** barium nitrate, barium peroxide, antimony, PETN (Pentaerythritol Tetranitrate), magnesium, tetrazene, ***nitrocellulose****, ***diphenylamine****, strontium peroxide, calcium resinate, barium nitrate, ***dinitrotoluene*** *, potassium chlorate, potassium nitrate, potassium sulfide, ***copper****, ***nitroglycerin****, ***iron***, nickel, ***zinc****	Lead, copper, zinc, explosives

General Munition Type	Type/Model	Case Composition	Filler	Potential MC	Selected MC Analytes
Cartridge , 50 Caliber, Machine Gun	M2 Ball M2 Armor Piercing (AP) M1 Tracer M10 Tracer M17 Tracer M21 Tracer M1Incendiary M23 Incendiary M1 Blank	Brass, steel, aluminum	Lead antimony, Tungsten chrome steel, Tracer Composition, Incendiary Composition, Single based propellant, Double based propellant, Primer composition	Aluminum, Antimony, Barium, Calcium, Chromium, ***Copper****, Dibutylphthalate, ***Dinitrotoluene****, Diphenylamine, ***Iron***, ***Lead***, Magnesium, Manganese, Molybdenum, ***Nitrocellulose****, Nitroglycerin, Potassium, Perchlorate, PETN (Pentaerythritol Tetranitrate), Strontium, Tetrazene, Tungsten, ***Zinc***	Lead, perchlorate, explosives
Shotgun, 12-gage	#7 1/2 and #9 shot for skeet target	Brass, steel, plastic	No. 7½ and No. 9 chilled shot, smokeless powder, primer mix	Arsenic, aluminum, ***antimony*** sulfide, barium, copper, diphenylamine, ***dinitrotoluene***, ***iron***, ***lead*** styphnate, lead thiocyanate, manganese, mercury fulminate, ***nitrocellulose, nitroglycerin***, PETN, potassium chlorate, tetrazene, TNT (trinitrotoluene), zinc	Antimony, lead, explosives
12-gage shotgun shells		Paper or brass Pellets of lead alloys (#00, #4, or #6 shot)	Lead, copper, zinc Lead	Lead, copper, zinc	Lead, copper, zinc

General Munition Type	Type/Model	Case Composition	Filler	Potential MC	Selected MC Analytes
Bomb, 100-lb, GP	AN-M30	Steel	50/50 Amatol with TNT boosters OR TNT with Tetryl boosters OR Tritonal	***Ammonium Nitrate, Iron, Tetryl, TNT (Trinitrotoluene)*** OR ***Iron, TNT (Trinitrotoluene), Tetryl*** OR ***Flaked Aluminum, Iron, TNT (Trinitrotoluene)***	Aluminum, explosives
Fuze Bomb, Nose	AN-M103, M103	Steel	Tetryl, Primer Mix	Barium Nitrate, ***Iron***, Lead Thiocyanate, Potassium Chlorate, ***Tetryl,*** TNT (Trinitrotoluene)	Explosives
Fuze, Bomb, Nose	M110	Steel	Tetryl, Primer Mixture, TNT (Trinitrotoluene)	Barium Nitrate, ***Iron***, Lead Azide, Lead Thiocyanate, Potassium Chlorate, ***Tetryl***, TNT (Trinitrotoluene)	Explosives
Fuze, Bomb, Tail	M100, AN-M100A1	Steel	Primer Mix, Tetryl, Black Powder	Antimony Sulfide, ***Iron,*** Lead Azide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sulfur, ***Tetryl***	Explosives
Fuze, Tail	M106 , AN-106	Steel	Primer Mix, Black Powder, Tetryl	Antimony Sulfide, ***Iron,*** Lead Azide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, ***Tetryl***	Explosives
Fuze, Bomb, Tail	M112	Steel	Primer Mixture, Delay Element, Detonator	Barium Chromate, Barium Nitrate, ***Iron***, Lead Azide, Lead Thiocyanate, Nickel, Potassium Chlorate, Potassium Perchlorate, ***Tetryl***, TNT (Trinitrotoluene)	Explosives
Bomb, 100lb, General Purpose	Mk1 and Mk4	Steel	TNT	***Iron, TNT (Trinitrotoluene)***	Explosives

General Munition Type	Type/Model	Case Composition	Filler	Potential MC	Selected MC Analytes
Fuze, Bomb, Nose	Mk219	Steel	Booster, Detonator, Primer Mixture	Antimony Sulfide, ***Iron***, Lead Thiocyanate, Mercury Fulminate, Potassium Chlorate, ***Tetryl,*** TNT (Trinitrotoluene)	Explosives
Fuze, Bomb, Nose	Mk233	Steel	Booster, Detonator, Primer Mixture	Antimony Sulfide, ***Iron***, Lead Thiocyanate, Lead Azide, Potassium Chlorate, ***Tetryl,*** TNT (Trinitrotoluene)	Explosives
Bomb, 100 lb, Practice	M85	Concrete, Steel	N/A	***Iron***	None
Charge, Spotting, Bomb	M1A1	Steel, Tin	Black Powder Smokeless Powder Primer Mix	Antimony Sulfide, Barium Nitrate, Dinitrotoluene, Diphenylamine, ***Iron***, Lead Azide, Lead Thiocyanate, Nitrocellulose, Nitroglycerin, Pentaerythritoltetranitrate, Potassium Chlorate, ***Potassium Nitrate***, Potassium Sulfate, ***Sulfur***, ***Tin***, TNT (Trinitrotoluene)	Explosives
Bomb, 3-lb, Miniature Practice	AN-Mk 5	Zinc Alloy	N/A	***Zinc***	Zinc
Bomb, 3-lb, Miniature Practice	AN-Mk 23	Cast Iron	N/A	***Iron***	None
Bomb, 4.5-lb, Miniature Practice	AN-Mk 43	Cast Lead	N/A	***Lead***	Lead
Cartridge, Signal, Bomb	Mk4 Mod 0	Cardboard, Steel	Black Powder, Primer Mixture, Red Phosphorus	Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Thiocyanate, Pentaerythritoltetranitrate, Potassium Chlorate, ***Potassium Nitrate, Red Phosphorus*** [(1)], ***Sulfur***, TNT (Trinitrotoluene)	Explosives

General Munition Type	Type/Model	Case Composition	Filler	Potential MC	Selected MC Analytes
Cartridge, Signal, Bomb	Mk4 Mod 1	Cardboard, Steel	Black Powder, Primer Mixture, Zinc Oxide	Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Thiocyanate, Pentaerythritoltetranitrate, Potassium Chlorate, ***Potassium Nitrate, Sulfur***, TNT (Trinitrotoluene), ***Zinc***	Zinc, explosives
Cartridge, Signal, Bomb	Mk4 Mod 2	Cardboard, Steel	Black Powder, Primer Mixture, Zinc Oxide	Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Thiocyanate, Pentaerythritoltetranitrate, Potassium Chlorate, ***Potassium Nitrate, Sulfur***, TNT (Trinitrotoluene), ***Zinc***	Zinc, explosives
Cartridge, Signal, Bomb	Mk4 Mod 3	Aluminum	Primer Mixture, Smokeless Powder, Red Phosphorus	Aluminum, Antimony Sulfide, Barium Nitrate, ***Dinitrotoluene, Diphenylamine, Dibutylphthalate***, Lead Azide, Lead Styphnate, Lead Thiocyanate, ***Nitrocellulos***e, Pentaerythritoltetranitrate, ***Red Phosphorus***(1), TNT (Trinitrotoluene)	Explosives
Cartridge, Signal, Bomb	Mk4 Mod 4	Aluminum	Primer Mixture, Smokeless Powder, Zinc Oxide	Aluminum, Antimony Sulfide, Barium Nitrate, ***Dinitrotoluene, Diphenylamine, Dibutylphthalate***, Lead Azide, Lead Styphnate, Lead Thiocyanate, Nitrocellulose, Pentaerythritoltetranitrate, TNT (Trinitrotoluene), ***Zinc***	Zinc, explosives
Cartridge, Signal, Bomb	Mk5	Plastic	Fluorescein Dye	N/A	None

* Items with the asterisk are for the propulsion portion of the annotated munition item and should be considered for analysis if samples are collected from the firing line (if firing line location is known).

Items in Bold italics are indicative of the major constituents (approximately 2% or more of total) of that particular munition's main filler.
(1) – Although red phosphorus is a potential constituent, there is no analysis method for red phosphorus at this time.

Table 4.2
Summary of Qualitative Reconnaissance Observations
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

MRS	Munitions and Explosives of Concern	Munitions Debris	Munitions Related Features
Bomb Target #1	None	None	None
Multiple Use Target	None	0.50-caliber ammunition (projectile only) at observation 13; observation 13 is located on the southern boundary of the Multiple Use Target	None
Bomb Target #2	None	None	None
Rifle Range	None	0.50-caliber ammunition (projectile only) at observation 9; observation 9 is located on the southern boundary of the Rifle Range MRS and within the northern portion of the Gunnery Range MRS	None
Gunnery Range	None	None besides 0.50-caliber ammunition (projectile only) at observation 13, as previously described above, which was just north of the Gunnery Range	None
Remaining Land	None	0.50-caliber ammunition (projectile only) at observation 13; this MD location also falls within a potential AOI (the adjusted Multiple Use Target)	None

4.1.2 Data Quality Objectives

4.1.2.1 Introduction

4.1.2.1.1 DQOs are qualitative and quantitative statements that clarify study objectives and specify the type and quality of the data necessary to support decisions. The development of DQOs for a specific site takes into account factors that determine whether the quality and quantity of data are adequate for project needs, such as data collection, uses, types, and needs. While developing these DQOs in accordance with the process presented in Chapter 3, paragraph 3.1.2 of the PWP, Parsons followed the *Guidance on Systematic Planning Using the Data Quality Objectives Process*, USEPA QA/G-4, USEPA/240/B-06/001 (USEPA 2006).

4.1.2.1.2 The goal of the TPP process is to achieve stakeholder, USACE, and applicable state and federal regulatory concurrence with the DQOs for a given site. The TPP Team approved the Hammond Bombing and Gunnery Range DQOs at the TPP meeting in February 2008. Appendix B of this SI Report presents the TPP documentation. Tables 4.3 through 4.6 present the DQO worksheets. *All the DQOs for the MRSs have been met.*

4.1.2.1.3 As stated in Subchapter 1.2 of this SI Report, data must be sufficient to do the following: 1) determine whether a removal action is necessary; 2) enable HRS scoring by the USEPA; 3) characterize the release for effective and rapid initiation of an RI/FS if necessary; and 4) complete the MRSPP.

4.1.2.1.4 DQOs cover four project objectives that SI data must satisfy: 1) evaluate potential presence of MEC; 2) evaluate potential presence of MC; 3) collect data needed to complete MRSPP scoring sheets; and 4) collect information for HRS scoring.

4.1.2.2 Munitions and Explosives of Concern Data Quality Objective

The MEC DQO was achieved by evaluating potential presence of MEC at the Hammond Bombing and Gunnery Range FUDS property. A total of 22.4 miles of QR was conducted (exceeding the 19.1 miles proposed in the SS-WP), and the path locations generally matched those presented in the SS-WP. The field team searched for visual evidence of MEC and MD at the site MRSs. No MEC items were observed at the site. Two MD items were observed, one within the Rifle Range MRS and one just north of the Gunnery Range MRS. The MEC DQO is considered to have been met because all MRSs were evaluated for MEC.

4.1.2.3 Munitions Constituents Data Quality Objective

4.1.2.3.1 The MC DQO was achieved by evaluating potential presence of MC at Hammond Bombing and Gunnery Range. The complete list of munitions potentially used at the Hammond Bombing and Gunnery Range MRSs, and the constituents of those munitions is presented in Table 4.1.

4.1.2.3.2 It was agreed by the TPP Team that the surface soil samples collected during the SI would be analyzed for explosives and select metals (aluminum, antimony, chromium, copper, lead, and zinc). Groundwater samples were analyzed for explosives, select metals (aluminum, antimony, chromium, copper, lead, and zinc), and perchlorate. The results of the MC sampling are evaluated further in Chapters 5 and 6.

4.1.2.4 Munitions Response Site Prioritization Protocol Data Quality Objective

The MRSPP DQO was achieved by obtaining sufficient information to complete the MRSPP scoring sheets. Specific input data were collected, and the three modules for the MRSPP were populated for each MRS as part of the SI. The scoring sheets for the MRSPP are included in Appendix K.

4.1.2.5 Hazard Ranking System Data Quality Objective

The HRS DQO was achieved by including information in the SI report necessary for the USEPA to populate the HRS score sheets. Source documents for the HRS information include the INPR, ASR, and ASR Supplement documents, as well as the MC sampling results reported in Chapter 5 and information from local and state agencies regarding population, groundwater well users, and drinking water well use.

4.2 BOMB TARGET #1 MUNITIONS RESPONSE SITE

4.2.1 Historical Munitions and Explosives of Concern

4.2.1.1 The Bomb Target #1 MRS (649 acres) is a circular precision bomb target located in the extreme northern portion of Hammond Bombing and Gunnery Range. According to the ASR Supplement, this target was used for high explosive (HE) bomb target practice (USACE 2004b). Munitions used at Bomb Target #1, according to the ASR Supplement, include AN-M30 100-lb. general purpose bombs and MK I 100-lb. general purpose bombs. Specific details (fillers, composition, *etc*.) of the munitions used at the Bomb Target #1 MRS are listed in Table 4.1.

4.2.1.2 The ASR site inspection team observed numerous bomb craters surrounded by pieces of HE bomb fragments during their April 2002 inspection. The ASR deemed that the Bomb Target #1 MRS has a "confirmed ordnance presence." The Hammond Bombing and Gunnery Range March 2003 Project Fact Sheet (included in the Hammond Bombing and Gunnery Range ASR) reports a RAC score of "3" for the Bomb Target #1 MRS, while the ASR Supplement reports a RAC score of "4."

4.2.2 Inspection Activities

To assess the presence of MEC contamination at the Bomb Target #1 MRS, the SI field team conducted QR over a walked path of approximately 3.1 miles. No MEC or MD was observed at this MRS. No craters were observed. One surface soil sample (100m x 100m DU with 100 sample increments) and one groundwater sample were collected within the Bomb Target #1 MRS.

4.3 MULTIPLE USE TARGET MUNITIONS RESPONSE SITE

4.3.1 Historical Munitions and Explosives of Concern

4.3.1.1 The Multiple Use Target MRS (3,108 acres) is a wedge-shaped target that originates just outside the western edge of the FUDS boundary and travels eastward through the central and northern portions of Hammond Bombing and Gunnery Range. According to the ASR Supplement (USACE 2004b), this target was used for strafing practice and skip bombing. According to the ASR and ASR Supplement, munitions used at this MRS include M38A2 100-lb. practice bombs, M85 100-lb. concrete practice bombs, M5 2.25-inch practice rockets, M1A1/M3/M5 spotting charges, 0.50-caliber machine gun ammunition, and general small arms ammunition. Specific details (fillers,

composition, *etc*.) of the munitions used at the Multiple Use Target MRS are listed in Table 4.1.

4.3.1.2 Two locations for the Multiple Use Target MRS are shown on Figure 4.1, one reflecting the location presented in the ASR Supplement (solid boundary) and another (dashed boundary) reflecting the location the Tangipahoa Sheriff's Department believes the MRS to be located. The area encompassed by both boundaries is the same, as is the orientation of both boundaries. The adjusted boundary was made by simply shifting the original boundary approximately one mile south.

4.3.1.3 The ASR site inspection team observed multiple MD items within the Multiple Use Target MRS during the site visit in April 2002. These items included 0.50-caliber projectiles and pieces of M38A2 100-lb. practice bombs. The site visit team also found bomb cratering in the target area. The ASR deemed that the Multiple Use Target MRS has a "confirmed ordnance presence." The Hammond Bombing and Gunnery Range March 2003 Project Fact Sheet (included in the Hammond Bombing and Gunnery Range ASR) and ASR Supplement reported a RAC score of "4" for the Multiple Use Target MRS.

4.3.2 Inspection Activities

4.3.2.1 To assess the presence of MEC contamination at the Multiple Use Target MRS, the SI field team conducted QR over a walked path of approximately 3.8 miles. No MEC or MD was observed within this MRS, but one of the 0.50-caliber projectile findings was located just south of the MRS. One surface soil sample (50m x 50m DU with 50 sample increments) was collected within the Multiple Use Target MRS. The sample was collected within the firing fan area of the MRS, in a location where rockets had been found in the past according to the Tangipahoa Sheriff. One surface soil sample was collected at the location of the projectile finding (50m x 50m DU with 50 sample increments).

4.4 BOMB TARGET #2 MUNITIONS RESPONSE SITE

4.4.1 Historical Munitions and Explosives of Concern

4.4.1.1 The Bomb Target #2 MRS (649 acres) is a circular precision bomb target located in the eastern central portion of Hammond Bombing and Gunnery Range. According to the ASR Supplement, this target was used for practice bomb target practice (USACE 2004b). According to the ASR and ASR Supplement, munitions used at this MRS include M38A2 100-lb. practice bombs, AN-MK4 3-lb. practice bombs, AN-MK5 3-lb. practice bombs, AN-MK23 3-lb. practice bombs, AN-MK43 4.5-lb. practice bombs, and M1A1/M3/M5 spotting charges. Specific details (fillers, composition, *etc*.) of the munitions used at the Bomb Target #2 MRS are listed in Table 4.1.

4.4.1.2 The ASR site inspection team observed numerous craters and pieces of M38A2 100-lb. practice bombs during their April 2002 inspection. The site inspection team noted that the craters were smaller than those observed at Bomb Target #1, but

some were large enough that they may have been created by HE bombs, which are not listed as being used at Bomb Target #2. The ASR deemed that the Bomb Target #2 MRS has a "confirmed ordnance presence." The Hammond Bombing and Gunnery Range March 2003 Project Fact Sheet (included in the Hammond Bombing and Gunnery Range ASR) reports a RAC score of "3" for the Bomb Target #2 MRS, while the ASR Supplement reports a RAC score of "4."

4.4.2 Inspection Activities

To assess the presence of MEC contamination at the Bomb Target #2 MRS, the SI field team conducted QR over a walked path of approximately 3.1 miles. No MEC, MD, or craters were observed at this MRS. One surface soil sample (50m x 50m DU with 50 sample increments) was collected within the Bomb Target #2 MRS, located near the center of the target circle.

4.5 RIFLE RANGE MUNITIONS RESPONSE SITE

4.5.1 Historical Munitions and Explosives of Concern

4.5.1.1 The Rifle Range MRS (999 acres) is a rectangular-shaped range located in the eastern portion of Hammond Bombing and Gunnery Range, partially overlapping the southern portion of the Gunnery Range MRS. According to the ASR Supplement, this range was a stand-alone Rifle Range (USACE 2004b). According to the ASR and ASR Supplement, munitions used at this MRS include general small arms ammunition. Specific details (fillers, composition, *etc*.) of the munitions used at the Rifle Range MRS are listed in Table 4.1.

4.5.1.2 The ASR site inspection team observed evidence of usage at the Rifle Range MRS in the form of 0.30-caliber projectiles during their April 2002 inspection. The site inspection team noted that no cratering or areas of stressed vegetation were observed at the Rifle Range. The ASR deemed the Rifle Range MRS to have "no ordnance presence." The Hammond Bombing and Gunnery Range March 2003 Project Fact Sheet (included in the Hammond Bombing and Gunnery Range ASR) and ASR Supplement reported a RAC score of "5" for the Rifle Range MRS.

4.5.2 Inspection Activities

To assess the presence of MEC contamination at the Rifle Range MRS, the SI field team conducted QR over a walked path of approximately 2.8 miles. One MD item, a 0.50-caliber projectile, was observed within the Rifle Range, but no MEC was observed at this MRS. One surface soil sample (50m x 50m DU with 50 sample increments) was collected within the Rifle Range MRS. The sample location was placed near the firing point, at the western end of the range.

4.6 GUNNERY RANGE MUNITIONS RESPONSE SITE

4.6.1 Historical Munitions and Explosives of Concern

4.6.1.1 The Gunnery Range MRS (640 acres) is a rectangular-shaped range located in the eastern portion of Hammond Bombing and Gunnery Range, partially overlapping the northern portion of the Rifle Range MRS and lying within the adjusted Multiple Use Target boundary. According to the ASR Supplement, this range was a stand-alone air to ground strafing range (USACE 2004b). According to the ASR and ASR Supplement, munitions used at this MRS include 0.50-caliber machine gun ammunition and general small arms ammunition. Specific details (fillers, composition, *etc*.) of the munitions used at the Gunnery Range MRS are listed in Table 4.1.

4.6.1.2 The ASR site inspection team observed evidence of usage at the Gunnery Range MRS in the form of 0.30-caliber and 0.50-caliber projectiles during their April 2002 inspection. The site inspection team noted that no cratering or areas of stressed vegetation were observed at the Gunnery Range. The ASR deemed that the Gunnery Range MRS has "no ordnance presence." The INPR and ASR Supplement reported a RAC score of "5" for the Gunnery Range MRS.

4.6.2 Inspection Activities

To assess the presence of MEC contamination at the Gunnery Range MRS, the SI field team conducted QR over a walked path of approximately 1.5 miles. One MD item, a 0.50-caliber projectile was observed directly on the southern boundary of the Gunnery Range, but no MEC was observed at this MRS. One surface soil sample (50m x 50m DU with 50 sample increments) was collected within the Gunnery Range MRS. The sample location was placed at the western end of the range, near the reported area of the strafing targets.

Table 4.3
MEC Data Quality Objective Worksheet

SITE: **Hammond Bombing and Gunnery Range**
PROJECT: **MMRP Site Inspection / FUDS No. A06LA030901**

DQO Element Number[a]	DQO Element Description[a]	Site-Specific DQO Statement	Objectives Met? Yes (Y)/No (N)
Intended Data Use(s):			
1	Project Objective(s) Satisfied	Evaluate presence/lack thereof of MEC	Y
Intended Need Requirements:			
2	Data User Perspective(s)	Risk, Remedy	Y
3	Contaminant or Characteristic of Interest	MEC, Munitions Debris	Y
4	Media of Interest	N/A	N/A
5	Required Sampling Locations or Areas and Depths	N/A	N/A
6	Number of Samples Required	N/A	N/A
7	Reference Concentration of Interest or Other Performance Criteria	Indications of target areas. Visual confirmation of MEC.	Y
Appropriate Sampling and Analysis Methods:			
8	Sampling Method	Qualitative Reconnaissance	Y
9	Analytical Method	N/A	N/A

[a] Refer to EM 200-1-2, Paragraph 4.2.1

Table 4.4
MC Data Quality Objective Worksheet

SITE: **Hammond Bombing and Gunnery Range**
PROJECT: **MMRP Site Inspection / FUDS No. A06LA030901**

DQO Element Number[a]	DQO Element Description[a]	Site-Specific DQO Statement	Objectives Met? Yes (Y)/No (N)
Intended Data Use(s):			
1	Project Objective(s) Satisfied	Evaluate presence/lack thereof of MC	Y
Intended Need Requirements:			
2	Data User Perspective(s)	Risk, Remedy	Y
3	Contaminant or Characteristic of Interest	Aluminum, antimony, chromium, copper, lead, zinc, perchlorate, and explosives	Y
4	Media of Interest	Surface soil and groundwater	Y
5	Required Sampling Locations or Areas and Depths	As shown on Figure 3.1, and agreed on during TPP Meeting.	Y
6	Number of Samples Required	8 surface soil samples and 3 groundwater samples	Y
7	Reference Concentration of Interest or Other Performance Criteria	LDEQ RECAP soil to groundwater criteria for non-ambient samples; lower of USGS background or ambient results for background	Y
Appropriate Sampling and Analysis Methods:			
8	Sampling Method	Composite samples in accordance with TPP Team concurrence	Y
9	Analytical Method	Metals (SW6010B), perchlorate (SW6850), and explosives (SW8330B)	Y

[a] Refer to EM 200-1-2, Paragraph 4.2.1

Table 4.5
MRSPP Data Quality Objective Worksheet

Site: Hammond Bombing and Gunnery Range
Project: MMRP Site Inspection / FUDS No. A06LA030901
DQO Statement Number: 3 of 4

Module	Table #	Table Description	Known Data	Current Data Gap	Data Source
Explosive Hazard Evaluation (EHE)	1	Munitions Type	X		Historical Records/Findings
	2	Source of Hazard	X		Historical Maps
	3	Location of Munitions	X		Historical or Field Findings
	4	Ease of Access	X		Field Findings
	5	Status of Property	X		Historical Records
	6	Population Density	X		U.S. Census Bureau
	7	Population Near Hazard	X		Field Findings
	8	Types of Activities/Structures	X		Regional Zoning
	9	Ecological and/or Cultural Resources	X		State Historic Preservation Office
	10	Determining the EHE	X		Scores from Tables 1 through 9
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration	X		Historical Records/Findings
	12	Sources of CWM	X		Historical Records/Findings
	13	Location of CWM	X		Historical or Field Findings
	14	Ease of Access	X		Field Findings
	15	Status of Property	X		Historical Records
	16	Population Density	X		U.S. Census Bureau
	17	Population Near Hazard	X		Field Findings
	18	Types of Activities/Structures	X		Regional Zoning
	19	Ecological and/or Cultural Resources	X		State Historic Preservation Office
	20	Determining the CHE	X		Scores from Tables 11 through 19
Health Hazard Evaluation (HHE)	21	Groundwater Data	X		Groundwater Sampling Results
	22	Surface Water - Human Endpoint	X		NA
	23	Sediment - Human Endpoint	X		NA
	24	Surface Water - Ecological Endpoint	X		NA
	25	Sediment - Ecological Endpoint	X		NA
	26	Surface Soil	X		Surface Soil Sampling Results
	27	Supplemental Contaminant Hazard Factor	X		All MC Sampling Results
	28	Determining the HHE	X		Scores from Tables 21 through 27
	29	MRS Priority	X		Scores from Tables 10, 20, and 28
	A	MRS Background Information	X		DoD Databases

Table 4.6
HRS Data Quality Objective Worksheet

Site: Hammond Bombing and Gunnery Range
Project: MMRP Site Inspection / FUDS No. A06LA030901
DQO Statement Number: 4 of 4

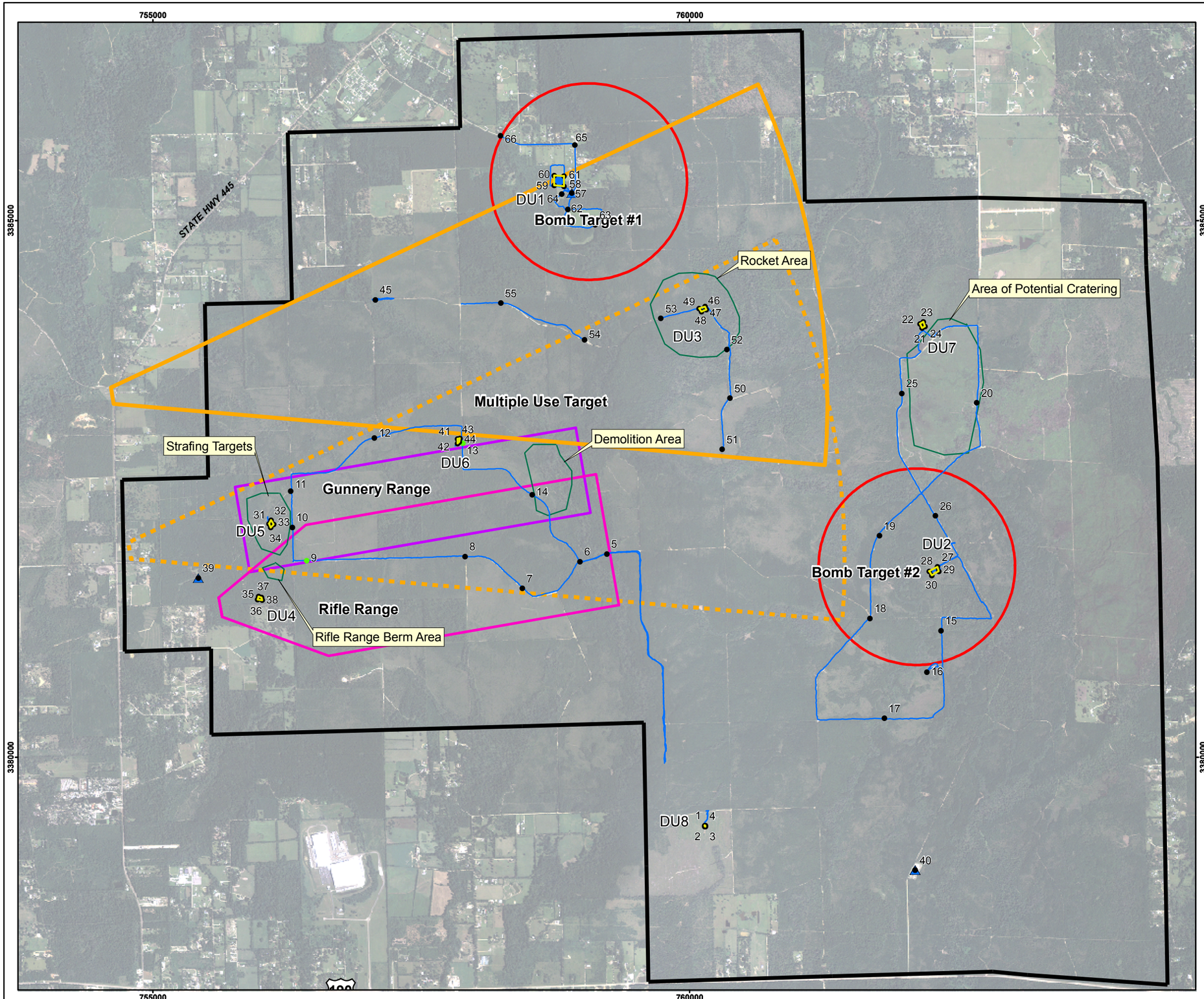
Data Description	Known Data	Current Data Gap	Data Source
Source Type	X		Historical Records/Findings
Estimated Volume or Area	X		Field Findings
Hazardous Substance	X		Constituents of Suspected Munitions
Groundwater Sample Concentration	X		Sample Results
Groundwater Use	X		Well Records/Municipal Data
Surface Water Sample Concentration	X		NA
Surface Water Pathways	X		Field Findings
Soil Sample Concentration	X		Sample Results
Soil Pathways	X		Municipal Data
Sensitive Environments	X		State Historic Preservation Office, US Fish and Wildlife Service, various government agencies
Attractiveness/Accessibility	X		Field Findings/Land Use Records

Figure 4.1

Qualitative Reconnaissance and Field Observation Locations

Hammond Bombing and Gunnery Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Munitions Debris Location
- Other Field Observation Location
- Groundwater Sample Location
- Qualitative Reconnaissance Track
- Decision Unit
- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary
- Adjusted Location of Multiple Use Target Based on Stakeholder Information
- Area of Potential Cratering AOI

Site Location in Louisiana

N

Image Source: Orthophoto, 2006
Projection: UTM Zone 15 NAD83, Map Units in Meters

3,000 1,500 0 3,000 Feet

PARSONS

U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	Qualitative Reconnaissance and Field Observation Locations
DRAWN BY: BT	
CHECKED BY: JB	SCALE: As Shown — PROJECT NUMBER: 744653.84115
SUBMITTED BY: DS	DATE: June 2009 — PAGE NUMBER: 4-17
	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig4_1.mxd

CHAPTER 5
MIGRATION/EXPOSURE PATHWAYS AND RECEPTORS

5.1 INTRODUCTION

5.1.1 This chapter of the SI Report evaluates the potential presence or absence of migration/exposure pathways and receptors, based on site-specific conditions. It is necessary to evaluate site-specific conditions and land use to evaluate risks posed to potential receptors under current and future land use scenarios. Exposure pathways for groundwater, surface water and sediment, soil, and air are evaluated. The Conceptual Site Exposure Model (CSEM) for the Hammond Bombing and Gunnery site (Appendix J) summarizes which potential receptor exposure pathways are (or may be) complete and which are (and are likely to remain) incomplete. An exposure pathway is not considered to be complete unless all four of the following elements are present (USEPA 1989). An example of a hypothetical groundwater exposure pathway is included.

- *A source and mechanism for contaminant release*. For example, a site has known MEC from which MC have leached and contaminated surface soil.
- *An environmental transport and/or exposure medium*. In the example, the MC in soil is mobile and can contaminate groundwater.
- *A point of exposure at which the contaminant can interact with a receptor*. A drinking water well drawing from the contaminated aquifer is located at the MRS.
- *A receptor and a likely route of exposure at the exposure point*. A resident uses groundwater as a source of drinking water.

5.1.2 In the hypothetical example above, all four elements are present. Therefore, the groundwater exposure pathway is complete. If any single factor was absent (for example, MC was not present in soil, or the resident obtained drinking water from another source), the pathway would be incomplete.

5.2 GENERAL INFORMATION

5.2.1 Regional Geologic Setting

5.2.1.1 The surface geology in the vicinity of Hammond Bombing and Gunnery Range consists of Holocene alluvium and Pleistocene terrace deposits. The alluvium material is found bounding surface water features. The terrace deposits slope southward and are considered part of the Anahuac Formation, which consists of an approximately 600-foot section of limestones, calcareous sands, and thin, interbedded shales. Beneath the Anahuac Formation lies the Frio Formation, which consists of sand and calcareous sands ranging in thickness from 850 to 1,150 feet.

5.2.1.2 During the Cenozoic Era, flowing streams, like the Missouri River and the Platte River, transported clay and sand to the central Gulf of Mexico while the Pecos and the Rio Grande Rivers delivered sediment loads to the western Gulf from the Rocky Mountain front. At the beginning of the Tertiary Period, marine waters extended northward into the Mississippi Embayment, almost to southern Illinois. Large volumes of sediment were transported from the western Rocky Mountain source to the Gulf of Mexico. Lesser amounts came through the Ohio River via the Mississippi River. The deposition of the sediment in coastal and near coastal environments caused the coastline to prograde gulfward ultimately to its current position. The large columns of sediment were accommodated in the basin through subsidence caused by large normal faults that were downthrown toward the basin with traces parallel to the basin margin. Eocene and Miocene depositional centers received thousands of feet of sediment as the basin subsided (USACE 2003).

5.2.2 Regional Hydrogeologic Setting

5.2.2.1 The aquifers of southeastern Louisiana consist of Pleistocene alluvial and terrace deposits and Pliocene and Miocene sediments in southwestern Mississippi. Recharge to the system occurs by direct infiltration of rainfall in outcrop areas and by the movements of water between aquifers in the system.

5.2.2.2 There are twelve major aquifers serving Tangipahoa Parish and adjoining St. Tammany Parish. These aquifers yield good quality water at rates of 1,000 gallons per minute to 3,000 gallons per minute. Large capacity wells are as deep as 3,354 feet in Tangipahoa Parish (USACE 2003).

5.2.3 Regional Groundwater Use

5.2.3.1 As stated above, there are many aquifers in the vicinity of Hammond Bombing and Gunnery Range that provide usable quantities of good quality water. As the site well report shows (Appendix L), there are numerous wells within the Hammond Bombing and Gunnery Range site, and there are numerous wells and well clusters surrounding the site. The onsite wells range in depth from 80 to 240 feet below ground surface (bgs). Detailed driller logs are not available for the wells, but it is interpreted from the well report that the three onsite wells sampled during the SI fieldwork range in depth from 80 feet bgs at the shallowest to 150 feet bgs at the deepest. The well report shows that almost all the wells surrounding the site are domestic supply wells and are at least 70 feet deep.

5.2.3.2 Table 5.1 lists the registered groundwater wells within 4 miles of Hammond Bombing and Gunnery Range. Information regarding the specific number of individuals using each of the drinking water wells was not available. Therefore, using available population information based on U.S. Census data for the year 2000 (Table 2.1), the SI assumes the 9,752 people living within the 0- to 4-mile buffer mostly use private domestic well water.

Table 5.1
Groundwater Wells in the Vicinity of Hammond Bombing and Gunnery Range

Distance from MRS	Domestic/Public Wells	Industrial Wells	Irrigation/Stock Wells	Other Wells	Total
On site	93	-	1	1	**95**
0 to ¼ mile	117	1	4	4	**126**
¼ to ½ mile	112	-	6	3	**121**
½ to 1 mile	132	-	7	12	**151**
1 to 2 miles	321	-	6	14	**341**
2 to 3 miles	508	-	20	14	**542**
3 to 4 miles	727	1	25	34	**787**
Site to 4 miles	**2,010**	**2**	**69**	**82**	**2,163**

Detailed well information is included in Appendix L.

5.2.4 Regional Hydrologic Setting

5.2.4.1 Tangipahoa Parish has three major sources of surface water, the Tangipahoa River, Tchefuncta River, and Natalbany River, plus their tributaries. The Tangipahoa and the Tchefuncta Rivers flow southward into Lake Pontchartrain, while the Natalbany River flows southward into the Ticklaw River. Lake Pontchartrain is located at the southern terminus of Tangipahoa Parish, approximately 10 miles south of Hammond Bombing and Gunnery Range. As shown on Figure 1.1, the Tangipahoa River runs just west of the site and the Tchefuncta River flows just east of the site. The Natalbany and Ticklaw Rivers are located well west of the site area and empty southward into Lake Maurepas. All of these rivers have tributaries within the site area (USACE 2003).

5.2.4.2 The USFWS Wetlands Online Mapper (USFWS 2008b), through the National Wetlands Inventory (NWI), was used to identify wetlands at Hammond Bombing and Gunnery Range. The wetland data shows several wetland areas south of Hammond Bombing and Gunnery Range. However, there is no wetland data mapped within the Hammond Bombing and Gunnery Range boundary. Based on the creeks and branches that run through the site and the type of wetlands normally associated with creeks and branches, it is anticipated that there are the same types of wetlands within the Hammond Bombing and Gunnery Range boundary as recorded south of the Hammond Bombing and Gunnery Range boundary. The predominant type of wetland anticipated within Hammond Bombing and Gunnery Range is:

- PFO1/4A-Palustrine, forested, broad-leaved deciduous/needle-leaved deciduous, temporarily flooded.

5.2.4.3 During the SI fieldwork, the site was very wet and swampy. Many of the roads were under water, as was most of the site. Lake Pontchartrain is located approximately five miles south of the site and is connected to the Gulf of Mexico.

5.2.5 Regional Sensitive Ecological Resources

5.2.5.1 Hammond Bombing and Gunnery Range is not located within a national wildlife refuge, national park, national forest, or state park. Due to the likely presence of wetlands on the site, the five Hammond Bombing and Gunnery Range MRSs are classified as potential important ecological places. Additionally, according to the National Oceanic Atmospheric Administration (NOAA) Coastal Zone Management Program (CZMP), Hammond Bombing and Gunnery Range does lie within a Coastal Zone Management Area (CZMA).

5.2.5.2 According to the Louisiana National Heritage Program, there are five federally and state listed species known to occur in Tangipahoa Parish. Of these five species, two species, the gopher tortoise *(Gopherus polyphemus)* and red-cockaded woodpecker *(Picoides borealis)*, are potentially found within the Hammond Bombing and Gunnery Range FUDS and MRS boundaries. The bald eagle *(Haliaeetus leucocephalus)* has been federally delisted, while the Gulf sturgeon *(Acipenser oxrinchus desotoi)* and manatee *(Trichechus manatus)* are only found in coastal water. The two species potentially found within the five Hammond Bombing and Gunnery Range MRSs are shown in Table 5.2. No threatened and endangered species were observed by the field team during the field activities at the site.

5.2.5.3 Based on the above information, a review of the Army Checklist for Important Ecological Places (USACE 2006) demonstrates that Hammond Bombing and Gunnery Range is an important ecological place due to the likely presence of wetlands, the potential presence of federally and state listed species at the site, and the site's inclusion in a CZMA.

5.2.6 Sample Locations/Methods

5.2.6.1 Surface soil samples were collected from eight DU locations within Hammond Bombing and Gunnery Range (Figure 5.1), seven of which were selected to represent areas with the highest likelihood for the presence of MEC or MC contamination (per the SS-WP [Parsons 2008a]) and the last from an ambient background area. One of the multi-incremental surface soil samples was collected in triplicate. Surface soil sample increments were collected from a depth of 0 to 2 inches, and the corners of the DU were recorded with a global positioning system (GPS) unit for inclusion in the geographic information system database.

5.2.6.2 Each of the discrete surface soil sampling locations within the DU were screened for potential subsurface anomalies and approved by the Unexploded Ordnance (UXO) Technician III using a Schonstedt GA-92XT*i* magnetometer prior to final location selection and sample collection. Per the PWP, the Schonstedt magnetometer underwent QC and battery checks each day of use to confirm that it was working properly. As agreed at the TPP meeting, the multi-incremental sampling technique was employed for the collection of all surface soil samples.

5.2.6.3 Three groundwater samples were also collected, one in duplicate. Two groundwater samples were associated with MRSs (one is within MRS01 and the other is near MRS02, MRS04, and MRS05), while the other was collected within the FUDS boundary but is not associated with any MRS. Surface soil and groundwater samples were analyzed by APPL

in Fresno, California for metals (aluminum, antimony, chromium, copper, lead, and zinc) (Method SW6010B), perchlorate (Method SW6850 [groundwater only]), and explosives (Method SW8330B), as agreed by the TPP Team. The analytical data for surface soil and groundwater samples are presented in Table 5.3 and Table 5.4.

Table 5.2
State and Federally Listed Species in Tangipahoa Parish, Louisiana

Common Name	Scientific Name	Federal Status	State Status
Red-Cockaded Woodpecker 	*Picoides borealis*	Endangered	Endangered
Gopher Tortoise 	*Gopherus polyphemus*	Threatened	Threatened

Table 5.3
Surface Soil Analytical Results
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

				HBGR-MRS01-DU1-SS-02 (Field Triplicate)						%RSD Field Triplicate		HBGR-MRS01-DU1-SS-02-02 (Lab Triplicate)						%RSD Lab Triplicate													
SAMPLE ID:		**HBGR-RL-DU8-SS-02-01***		**HBGR-MRS01-DU1-SS-02-01****		**HBGR-MRS01-DU1-SS-02-03****		**HBGR-MRS01-DU1-SS-02-02A****				**HBGR-MRS01-DU1-SS-02-02A*****		**HBGR-MRS01-DU1-SS-02-02B*****		**HBGR-MRS01-DU1-SS-02-02C*****				**HBGR-MRS02-DU2-SS-02-01**		**HBGR-MRS03-DU3-SS-02-01**		**HBGR-MRS04-DU4-SS-02-01**		**HBGR-MRS05-DU5-SS-02-01**		**HBGR-MRS05-DU6-SS-02-01**		**HBGR-AOC-DU7-SS-02-01**	
DATE SAMPLED:		**08/04/08**		**08/07/08**		**08/07/08**		**08/07/08**				**08/07/08**		**08/07/08**		**08/07/08**				**08/05/08**		**08/06/08**		**08/06/08**		**08/06/08**		**08/06/08**		**08/05/08**	
LAB SAMPLE ID:		**AX82332**		**AX82321**		**AX82325**		**AX82322**				**AX82322**		**AX82323**		**AX82324**				**AX82326**		**AX82327**		**AX82328**		**AX82329**		**AX82330**		**AX82331**	
	Units																														
Explosives - SW8330B																															
1,3,5-Trinitrobenzene	mg/kg	0.35	U	0.35	U	0.35	U	0.35	U	NA		0.35	U	0.35	U	0.35	U	NA		0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U
1,3-Dinitrobenzene	mg/kg	0.30	U	0.30	U	0.30	U	0.30	U	NA		0.30	U	0.30	U	0.30	U	NA		0.30	U	0.30	U	0.30	U	0.30	U	0.30	U	0.30	U
2,4,6-Trinitrotoluene (TNT)	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	NA		0.50	U	0.50	U	0.50	U	NA		0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
2,4-Dinitrotoluene	mg/kg	0.35	U	0.35	U	0.35	U	0.35	U	NA		0.35	U	0.35	U	0.35	U	NA		0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U
2,6-Dinitrotoluene	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	NA		0.50	U	0.50	U	0.50	U	NA		0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
2-Amino-4,6-dinitrotoluene	mg/kg	0.75	U	0.75	U	0.75	U	0.75	U	NA		0.75	U	0.75	U	0.75	U	NA		0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
2-Nitrotoluene	mg/kg	0.30	U	0.30	U	0.30	U	0.30	U	NA		0.30	U	0.30	U	0.30	U	NA		0.30	U	0.30	U	0.30	U	0.30	U	0.30	U	0.30	U
3-Nitrotoluene	mg/kg	1.0	U	1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
4-Amino-2,6-dinitrotoluene	mg/kg	1.3	U	1.3	U	1.3	U	1.3	U	NA		1.3	U	1.3	U	1.3	U	NA		1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U
4-Nitrotoluene	mg/kg	1.0	U	1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/kg	1.0	U	1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	mg/kg	1.0	U	1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Nitrobenzene	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	NA		0.50	U	0.50	U	0.50	U	NA		0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Nitroglycerin	mg/kg	1.0	U	1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	**0.31**	J
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	mg/kg	1.0	U	1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Pentaerythritol Tetranitrate (PETN)	mg/kg	2.5	U	2.5	U	2.5	U	2.5	U	NA		2.5	U	2.5	U	2.5	U	NA		2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Metals - SW6010B																															
Aluminum	mg/kg	**3410**		**6430**		**6020**	J	**6050**		3.7		**6050**		**5160**		**6300**		10		**4400**		**4330**		**5130**		**4480**		**2720**		**4110**	
Antimony	mg/kg	0.29	UJ	**0.44**	J	0.20	UJ	0.20	UJ	NA		0.20	UJ	0.20	UJ	0.20	UJ	NA		0.20	UJ	**0.44**	J	0.20	UJ	**0.44**	J	0.20	UJ	0.22	UJ
Chromium	mg/kg	**4.3**	J	**8.3**	J	**8.6**	J	**7.1**	J	9.9		**7.1**	J	**8.8**	J	**7.9**	J	11		**4.5**	J	**180**	J	**7.8**	J	**5.0**	J	**4.7**	J	**4.5**	J
Copper	mg/kg	**4.9**	J	**3.6**	J	**3.5**	J	**3.4**	J	2.9		**3.4**	J	**3.4**	J	**3.3**	J	1.7		**1.9**	J	**3.1**	J	**3.8**	J	**4.5**	J	**1.7**	J	**2.0**	J
Lead	mg/kg	**8.6**	J	**6.3**	J	**8.4**	J	**6.3**	J	17		**6.3**	J	**6.1**	J	**6.3**	J	1.9		**5.4**	J	**6.7**	J	**9.2**	J	**5.3**	J	**4.7**	J	**4.9**	J
Zinc	mg/kg	**23**	J	**11**	J	**11**	J	**11**	J	0		**11**	J	**10**	J	**12**	J	9.1		5.0	UJ	5.0	UJ	5.8	UJ	5.0	UJ	5.0	UJ	5.0	UJ

QA NOTES AND DATA QUALIFIERS:

(NO CODE) - Confirmed identification.
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit (PQL_sa).
UJ - Analyte not detected, reported PQL_sa may be inaccurate or imprecise.
J - Analyte detected, estimated concentration.
* - Ambient sample.
** - Field triplicate sample.
*** - Lab triplicate sample.
Detections are bolded.
%RSDs are highlighted.
NA - %RSD could not be calculated because at least one triplicate sample concentration was less than the sample specific practical quantitation limit (PQL_sa).

Table 5.4
Groundwater Analytical Results
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

SAMPLE ID:		Hammond Bombing and Gunnery Range-GW-01*		Hammond Bombing and Gunnery Range-GW-04**		Hammond Bombing and Gunnery Range-GW-02		Hammond Bombing and Gunnery Range-GW-03	
DATE SAMPLED:		**08/06/08**		**08/06/08**		**08/06/08**		**08/07/08**	
LAB SAMPLE ID:		**AX82344**		**AX82345**		**AX82333**		**AX82334**	
	Units								
Explosives - SW8330B									
1,3,5-Trinitrobenzene	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
1,3-Dinitrobenzene	µg/L	0.50	U	0.50	U	0.50	U	0.50	U
2,4,6-Trinitrotoluene (TNT)	µg/L	0.50	U	0.50	U	0.50	U	0.50	U
2,4-Dinitrotoluene	µg/L	0.50	U	0.50	U	0.50	U	0.50	U
2,6-Dinitrotoluene	µg/L	0.50	U	0.50	U	0.50	U	0.50	U
2-Amino-4,6-dinitrotoluene	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
2-Nitrotoluene	µg/L	0.50	U	0.50	U	0.50	U	0.50	U
3-Nitrotoluene	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
4-Amino-2,6-dinitrotoluene	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
4-Nitrotoluene	µg/L	0.50	U	0.50	U	0.50	U	0.50	U
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	0.50	U	0.50	U	0.50	U	0.50	U
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
Nitrobenzene	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
Nitroglycerin	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	µg/L	1.0	U	1.0	U	1.0	U	1.0	U
Pentaerythritol Tetranitrate (PETN)	µg/L	6.0	U	6.0	U	6.0	U	6.0	U
Total Metals - SW6010B									
Aluminum	µg/L	100	U	100	U	100	U	100	U
Antimony	µg/L	3.0	U	3.0	U	3.0	U	3.0	U
Chromium	µg/L	5.0	U	5.0	U	5.0	U	5.0	U
Copper	µg/L	**18**		**17**		**9.2**		**1.7**	J
Lead	µg/L	**1.1**	J	**1.6**	J	2.0	U	**0.50**	J
Zinc	µg/L	**430**	J	**470**		**59**		**23**	J
Perchlorate - SW6850									
Perchlorate	µg/L	0.60	U	0.60	U	0.60	U	0.60	U

QA NOTES AND DATA QUALIFIERS:

(NO CODE) - Confirmed identification.
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit (PQL_sa).
J - Analyte detected, estimated concentration.
* - Ambient sample.
** - Field duplicate of sample on left.
Detections are bolded.

5.2.7 Background/Ambient Metals Concentrations

5.2.7.1 No site-specific statistical evaluation of background metals concentrations is available. Due to the limited scope of the SI, conducting a site-specific statistical background evaluation of metals concentrations (which typically requires collection of at least 10 background samples) was not considered practical or warranted at this stage of investigation. Two sources of information, each described in detail in the following paragraphs, were used to approximate background metals concentrations in soil at the site:

- Average concentrations of elements in Tangipahoa Parish, Louisiana, identified by the USGS (USGS 2006), and
- Analytical results of the ambient sample collected during the August 2008 SI field activities within the FUDS boundary in an area outside the MRSs that was not expected to be affected by munitions activities.

5.2.7.2 The nationwide Mineral Resources Data System (MRDS) database of concentrations of elements provides county/parish-specific background values for selected metals. The MRDS includes mineral resource occurrence data covering the world, most thoroughly within the United States. This database contains the records previously provided in the MRDS of USGS and the Mineral Availability System/Mineral Industry Locator System originated by the U.S. Bureau of Mines, which is now part of the USGS. According to the USGS, the MRDS is a large and complex relational database developed over several decades by hundreds of researchers and reporters (USGS 2006). This dataset is considered to be more representative of conditions within Tangipahoa Parish; however, the data available are limited to a select group of metals. The USGS derived background concentrations are based on three times the mean concentration for Tangipahoa Parish. The USGS data for Tangipahoa Parish is provided in Appendix L. As noted in Table 4.5a of the SS-WP (Parsons 2008a), mean concentrations for two metals (antimony and chromium) were acquired from an alternate USGS source. The alternate source was the *USGS Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States* (1984) Professional Paper 1270 (http://pubs.usgs.gov/pp/1270/pdf/PP1270_508.pdf).

5.2.7.3 To provide an indication of the range of concentrations of MC naturally present at the site, an ambient surface soil sample (HBGR-RL-DU8-SS-02-01) was collected during the SI. However, since USGS background concentrations were available for all the metals investigated in this SI, the ambient surface soil sample was not used to establish background concentrations. One ambient groundwater sample (HBGR-GW-01) was collected, as described in Subchapter 5.2.6. All ambient samples were collected outside the MRSs. No MEC or MD was noted near the ambient sample locations. Explosives were not detected in the ambient samples, further suggesting that the samples represent ambient conditions. The TPP Team determined that any exceedance of three times the background concentration would indicate an MC release.

5.2.7.4 Three times the USGS background concentrations for Tangipahoa Parish and the concentrations detected in the ambient sample are summarized for surface soil in Table 5.5. The ambient groundwater sample concentrations are used as the background concentrations for

comparison. The ambient groundwater sample concentrations are shown in Table 5.6 and the groundwater source evaluation table. The maximum concentration was multiplied by three to be used as background concentrations for the site, which is one of the criteria used to evaluate whether or not a source of MC contamination is present (Subchapter 5.2.8). Surface water, sediment, and air samples were not collected at the site.

Table 5.5
Surface Soil Background Concentrations, Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

Analyte [1]	Units	Tangipahoa Parish USGS Background Conc. [2]	HBGR-RL-DU8-SS-02-01 Ambient Sample		Calculated Background Concentration [3]
Metals					
Aluminum	mg/kg	**18450**	**3410**		**55000**
Antimony	mg/kg	**0.8** [4]	0.29	UJ	**2.3**
Chromium	mg/kg	**52** [4]	**4.3**	J	**160**
Copper	mg/kg	**7.1**	**4.9**	J	**21**
Lead	mg/kg	**17**	**8.6**	J	**51**
Zinc	mg/kg	**34**	**23**	J	**100**

(1) - No explosives were detected in the ambient surface soil sample.

(2) -USGS derived background concentration for Tangipahoa Parish, Louisiana (http://tin.er.usgs.gov/geochem/county.php?place=f22105&el=As&rf=southeastern)

(3) - The background concentrations are based on three times the USGS background concentrations.

(4) – USGS Element Concentrations in Soils and Other Suficial Materials of the Conterminous United States (1984) Professional Paper 1270 (http://pubs.usgs.gov/pp/1270/pdf/PP1270_508.pdf)

Data Qualifiers:

U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.

J - Analyte detected, estimated concentration.

Table 5.6
Groundwater Background Concentrations, Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

Analyte [1]	Units	HBGR-GW-01 Ambient Sample		HBGR-GW-04 Field Duplicate of HBGR-GW-01		Selected Background Concentration [2]	
Metals							
Aluminum	µg/L	100	U	100	U	100	U
Antimony	µg/L	3.0	U	3.0	U	3.0	U
Chromium	µg/L	5.0	U	5.0	U	5.0	U
Copper	µg/L	**18**		**17**		**54**	
Lead	µg/L	**1.1**	J	**1.6**	J	**4.8**	
Zinc	µg/L	**430**	J	**470**		**1410**	
(1) - No explosives or perchlorate were detected in the ambient groundwater sample.							
(2) -Selected background concentration is three times the maximum detected ambient concentration.							
Data Qualifiers:							
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.							
J - Analyte detected, estimated concentration.							

5.2.8 Munitions Constituent Source Evaluation

5.2.8.1 As explained in Subchapter 5.1, an exposure pathway is not considered to be complete unless MC contamination is present. To make this determination, the concentration of each MC is compared to several criteria. For an analyte to be considered contamination related to a release from munitions-related activities at the site, it is necessary for the following conditions to be true:

- The analyte is detected in the sample medium, and
- The analyte is present above the selected background concentration (see Subchapter 5.2.7), and
- The analyte is a potential constituent of the munitions formerly used at the site (see Table 4.1).

5.2.8.2 Each MC analyzed was evaluated against these criteria to determine whether or not potential MC contamination is present. Only detections of metals that meet the conditions noted above are evaluated further in the SLRA in Chapter 6. Any detection of explosives is considered to be MC contamination and is evaluated in the SLRA in Chapter 6.

5.3 BOMB TARGET #1 MUNITIONS RESPONSE SITE

5.3.1 This subchapter of the SI Report describes the evaluation of exposure pathways for the Bomb Target #1 MRS (MRS01). The analysis of each pathway is based on the

analytical results for each medium of concern and the current and future land use information presented in Subchapter 2.2.6. The CSEM for MRS01 is provided in Appendix J.

5.3.2 As described in Subchapter 2.1, the 15,215.9-acre property formerly known as Hammond Bombing and Gunnery Range is located in Tangipahoa Parish, approximately five miles east of Hammond, Louisiana, along U.S. Highway 190. Hammond Bombing and Gunnery Range was returned to the previous owners after its military use. Today, the majority of the land is managed for lumber production land and hunting. This land was owned for many years by a trust managed by the Bennett-Peters Company. The land is currently owned by the Reimers Company. The remaining land areas not under the trust management were returned to private landowners and are used for private residences and small business properties. Future land use at this site is expected to remain the same.

5.3.1 Historical Munitions Constituents Information

To date, no data exist to indicate that MC related to the use of ordnance affected MRS01.

5.3.2 Groundwater Migration Pathway

Groundwater can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the groundwater, site-specific geology, climate, and the expected future land use.

5.3.2.1 Geologic and Hydrogeologic Setting

There are no known differences between the geologic and hydrogeologic setting at MRS01 and the setting described for the overall site in Subchapter 5.2.1 and Subchapter 5.2.2.

5.3.2.2 Releases and Potential Releases to Groundwater

There are no known releases or potential releases of MC to groundwater at MRS01.

5.3.2.3 Groundwater Migration Pathways and Receptors

Table 5.1 summarizes the number and type of wells as well as their distance from the FUDS boundary. Some of these wells are within MRS01, as shown on Figure 5.2. Based on the known current and future uses of the land, the potential receptors include current and future residents, commercial and industrial workers, site visitors, and recreational users. It is generally assumed that groundwater is not directly accessible to ecological receptors, due to the inability of these receptors to interact with groundwater. Therefore, the groundwater exposure pathway is incomplete for ecological receptors.

5.3.2.4 Groundwater Sample Locations/Methods

Groundwater samples were collected at the locations displayed on Figure 5.1 using the methods stated in the SS-WP (Parsons 2008a). The samples were analyzed for metals

(Method SW6010B), explosives (Method SW8330B), and perchlorate (SW6850). One biased groundwater sample (HBGR-GW-03) was collected at MRS01. An ambient groundwater sample (HBGR-GW-01) and a field duplicate (HBGR-GW-04) were also collected at the site, but not within MRS01.

5.3.2.5 Groundwater Analytical Results

The analytical results for the groundwater sample collected from MRS01 and the ambient sample are presented in Table 5.4. These results were evaluated using the criteria described in Subchapter 5.2.8. No explosives or perchlorate were detected in the MRS01 groundwater sample, so this evaluation was performed for metals only. The source evaluation for groundwater is summarized in Table 5.7. As shown in this table, three of the MC (copper, lead, and zinc) were detected in the groundwater sample analyzed for MRS01. When compared to the selected background concentrations identified in Tables 5.6, all detected MC analytes were below the background concentrations. Therefore, based on these sample results, munitions-related MC contamination is not identified in the groundwater at MRS01.

Table 5.7
Bomb Target #1 Groundwater Source Evaluation

Analyte[1]	Units	Maximum Detected Site Conc.		Background Conc. [2]		Exceeds Background Conc.?	Potential MC? [3]	SLRA Required?	Primary reason for exclusion from SLRA
Metals									
Aluminum	µg/L	100	U	100	U	No	**Yes**	No	Not detected at MRS
Antimony	µg/L	3.0	U	3.0	U	No	**Yes**	No	Not detected at MRS
Chromium	µg/L	5.0	U	5.0	U	No	No	No	Not detected at MRS
Copper	µg/L	1.7	J	54		No	**Yes**	No	Not detected above background
Lead	µg/L	0.50	J	4.8		No	**Yes**	No	Not detected above background
Zinc	µg/L	23	J	1410		No	**Yes**	No	Not detected above background
(1) - No explosives or perchlorate were detected in the ambient or biased media samples at this MRS.									
(2) - Background Concentrations as established in Table 5.6.									
(3) - Potential MC as listed in Table 4.1									
Data Qualifiers:									
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.									
J - Analyte detected, estimated concentration.									

5.3.2.6 Groundwater Migration Pathway Conclusions

Three MC (copper, lead, and zinc) were detected in the groundwater sample analyzed for MRS01. However, the concentrations of these analytes were below the selected background concentrations. Therefore, based on the analytical results presented in this report, potential MC contamination is not present within groundwater at MRS01. Therefore, the groundwater exposure pathway is incomplete for the human receptors using the groundwater medium at MRS01.

5.3.3 Surface Water and Sediment Migration Pathway

Surface water can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the surface water and sediment through runoff and erosion.

5.3.3.1 Hydrologic Setting

There are no major streams or rivers running through Hammond Bombing and Gunnery Range, but there are several small creeks and tributaries present on the site that empty to major rivers, some of which lie partially within MRS01. The MRS01 hydrology does not differ significantly from the setting described for the overall site in Subchapter 5.2.4.

5.3.3.2 Releases and Potential Releases to Surface Water and Sediment

There are no known releases of MC to surface water or sediment at MRS01. The presence of local surface water provides a potential migration pathway through which releases of MC to soil, as a result of munitions activities, could migrate to surface water or sediment via runoff or erosion.

5.3.3.3 Surface Water and Sediment Migration Pathways and Receptors

The presence of local surface water provides a potential migration pathway through which releases of MC to soil as a result of munitions activities could migrate to surface water or sediment via runoff or erosion. Potential receptors would include current and future residents, commercial and industrial workers, site visitors, recreational users and ecological receptors.

5.3.3.4 Sample Locations/Methods

No surface water or sediment sampling was conducted for evaluation of MRS01 as per the decision of the TPP Team. Surface soil is considered to be the primary indicator of the potential for MC contamination. Therefore, sampling efforts were primarily focused on that medium.

5.3.3.5 Surface Water and Sediment Analytical Results

No surface water or sediment sampling was conducted for evaluation of MRS01 since surface soil is the medium most likely directly affected by the practice bombing and gunnery activities as per the decision of the TPP Team.

5.3.3.6 Surface Water and Sediment Migration Pathway Conclusions

Surface water and sediment were not collected at MRS01 since surface soil is the medium most likely directly affected by the practice bombing and gunnery activities, in accordance with the directions from the TPP Team. None of the MC metals were detected above the selected background concentrations and explosives were not detected in the surface soil samples collected from the site, as discussed in Subchapter 5.3.4.5. There is not a potential source of MC contamination, failing to provide an essential element necessary for a complete migration pathway. Therefore, the surface water and sediment migration pathways for all receptors at MRS01 are incomplete.

5.3.4 Soil Exposure Pathway

Potential soil exposure pathways include incidental ingestion, dermal contact, and inhalation of re-suspended particulates by human and ecological receptors. Ecological receptors may also be exposed through ingestion of biota that have been exposed to MC in soil. Contamination in soil can also leach to groundwater and be transferred to surface water and sediment via runoff and erosion. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil exposed at the ground surface, site-specific geology, climate, and expected future land use.

5.3.4.1 Physical Source Access Conditions

Hammond Bombing and Gunnery Range is mostly used for lumber production and hunting, with some portions used for residential and small business properties. Public access is primarily unrestricted at MRS01.

5.3.4.2 Actual or Potential Contamination Areas

MRS01 was originally used as a bombing target. As a result, the potential for munitions-related contamination exists within the MRS.

5.3.4.3 Soil Exposure Pathways and Receptors

The MRS01 CSEM is presented in Appendix J. The soil exposure pathway provides for the potential exposure of human and ecological receptors on or near MRS01 who may come into contact with contaminated soil through incidental ingestion, dermal contact, or inhalation of re-suspended particulate matter. Based on the known current and future uses of the land, the potential receptors at the MRS would include current and future residents, commercial and industrial workers, site visitors, recreational users, and ecological receptors. Ecological

receptors may also come into contact with MC in the soil by ingestion of biota that have been exposed to MC in soil.

5.3.4.4 Sample Locations/Methods

One biased surface soil sample (HBGR-MSR01-DU1-SS-02-01) and two field triplicate samples (HBGR-MSR01-DU1-SS-02-02A and HBGR-MSR01-DU1-SS-02-03) were collected within MRS01, as shown on Figure 5.1. The biased surface soil sample location was selected to represent the area with the highest likelihood for the presence of MEC or MC contamination (per the SS-WP [Parsons 2008a]). Two lab triplicate samples (HBGR-MSR01-DU1-SS-02-02B and HBGR-MSR01-DU1-SS-02-02C) were also analyzed for the biased surface soil sample.

5.3.4.5 Soil Analytical Results

Analytical results for the surface soil sample and replicates collected from MRS01 are presented in Table 5.3. The results were used in the source evaluation (Table 5.8), using the criteria described in Subchapter 5.2.8. No explosives were detected in the surface soil samples, so the source evaluation was performed for MC metals only. Table 5.8 shows that none of the metals (aluminum, antimony, chromium, copper, lead, and zinc) were detected at concentrations that exceed their respective selected background concentrations.

Table 5.8
Bomb Target #1 Surface Soil Source Evaluation

Analyte (1)	Units	Maximum Detected Site Conc.		Background Conc. (2)		Exceeds Background Conc.?	Potential MC? (3)	SLRA Required?	Primary reason for exclusion from SLRA
Metals									
Aluminum	mg/kg	**6430**		**55000**		No	**Yes**	No	Not detected above background
Antimony	mg/kg	**0.44**	**J**	**2.3**		No	**Yes**	No	Not detected above background
Chromium	mg/kg	**8.8**	**J**	**160**		No	No	No	Not detected above background
Copper	mg/kg	**3.6**	**J**	**21**		No	**Yes**	No	Not detected above background
Lead	mg/kg	**8.4**	**J**	**51**		No	**Yes**	No	Not detected above background
Zinc	mg/kg	**12**	**J**	**100**		No	**Yes**	No	Not detected above background

(1) - No explosives were detected in the ambient or biased media samples at this MRS.

(2) - Background concentrations as established in Table 5.5.

(3) - Potential MC as listed in Table 4.1.

Data Qualifiers:

U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.

J - Analyte detected, estimated concentration.

5.3.4.6 Soil Exposure Pathway Conclusions

No explosives were detected in surface soil samples from MRS01, and the maximum detected concentrations of all metals analyzed did not exceed their respective selected background concentrations. Based on the analytical data, surface soil contamination is not indicated to have resulted from munitions-related activities at MRS01. Based on the available current and future land use at the site, the soil exposure pathway is incomplete for these MC metals. Consequently, no MC were retained for further evaluation in a SLRA.

5.3.5 Air Migration Pathway

The air migration pathway accounts for hazardous substance migration in gaseous or particulate form through the air. Inhalation of a contaminant can be a potential exposure pathway for human and ecological receptors. No air sampling was performed and the TPP Team agreed that air sampling would not be performed as part of this SI.

5.3.5.1 Climate

The climate at the site is described in Subchapter 2.2.3.

5.3.5.2 Releases and Potential Releases to Air

There are no known direct releases of MC to air at MRS01. The occurrence of significant windblown dust is unlikely and releases via this pathway are not expected based on the absence of MC contamination in the site soil (Subchapter 5.3.4.5).

5.3.5.3 Air Migration Pathways and Receptors

Because there are no known volatile contaminants at the site, the only remaining air migration pathway would be via the inhalation of fugitive dust. Based on the known current and future uses of the land, the potential receptors at MRS01 would be current and future residents, commercial or industrial workers, and site visitors or recreational users, as well as ecological receptors. These receptors could be exposed to surface soil through inhalation of resuspended particulate matter through the air migration pathway. The CSEM is presented in Appendix J.

5.3.5.4 Sample/Monitoring Locations/Methods

No air sampling is known to have been performed at MRS01 and the TPP Team agreed that air sampling would not be conducted as part of this SI.

5.3.5.5 Air Analytical Results

Not applicable.

5.3.5.6 Air Migration Pathway Conclusions

As discussed in Subchapter 5.3.4, no explosives or metals were detected in the surface soil samples collected; therefore, based on the analytical results presented in this report, there is no source of MC contamination at the site. Consequently, the air migration pathway is incomplete for all receptors at MRS01.

5.4 MULTIPLE USE TARGET MUNITIONS RESPONSE SITE

5.4.1 This subchapter of the SI Report describes the evaluation of exposure pathways for the Multiple Use Target (MRS02). The analysis of each pathway is based on the analytical results for each medium of concern and the current and future land use information presented in Subchapter 2.2.6. The CSEM for MRS02 is provided in Appendix J.

5.4.2 Within MRS02, the majority of the land is managed for lumber production and hunting. The remaining land is used for private residences and small business properties. Future land use at this site is expected to remain the same.

5.4.1 Historical Munitions Constituents Information

To date, no data exist to indicate that MC related to the use of ordnance affected MRS02.

5.4.2 Groundwater Migration Pathway

Groundwater can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the groundwater, site-specific geology, climate, and the expected future land use.

5.4.2.1 Geologic and Hydrogeologic Setting

There are no known differences between the geologic and hydrogeologic setting at MRS02 and the setting described for the overall site in Subchapter 5.2.1 and Subchapter 5.2.2.

5.4.2.2 Releases and Potential Releases to Groundwater

There are no known releases or potential releases of MC to groundwater at MRS02. Wells were identified within the MRS; however, the depth to groundwater utilized has not been identified. It is possible that MC potentially present in the soil could leach into shallow groundwater.

5.4.2.3 Groundwater Migration Pathways and Receptors

Table 5.1 summarizes the number and type of wells as well as their distance from the FUDS boundary. Some of these wells are within MRS02, as shown on Figure 5.2. The adjusted MRS boundary identified on the figure depicts the Multiple Use Target fan area as described by the Tangipahoa Sheriff's Department. Based on the known current and future uses of the land, the potential receptors include current and future residents, commercial and industrial workers, site visitors, and recreational users. It is generally assumed that groundwater is not directly accessible to ecological receptors, due to the inability of these receptors to interact with groundwater. Therefore, the groundwater exposure pathway is incomplete for ecological receptors.

5.4.2.4 Groundwater Sample Locations/Methods

Groundwater samples were collected at the locations displayed on Figure 5.1 using the methods stated in the SS-WP (Parsons 2008a). The samples were analyzed for metals (Method SW6010B), explosives (Method SW8330B), and perchlorate (SW6850). One biased groundwater sample (HBGR-GW-02) was collected from a well located south of the firing points for MRS02 and adjacent to the Rifle Range MRS (MRS04) and the Gunnery Range MRS (MRS05). This sample is associated with MRS02 for MC evaluation.

5.4.2.5 Groundwater Analytical Results

The analytical results for the groundwater sample associated with MRS02 are presented in Table 5.4. These results were evaluated using the criteria described in Subchapter 5.2.8. No explosives or perchlorate were detected in the groundwater sample, so this evaluation was performed for metals only. The source evaluation for groundwater is summarized in Table 5.9.

As shown in this table, two of the MC (copper and zinc) were detected in the groundwater sample. When compared to the selected background concentrations identified in Table 5.6, all detected MC analytes were below the background concentrations. Therefore, based on these sample results, munitions-related MC contamination is not identified in the groundwater at MRS02.

Table 5.9
Multiple Use Target Groundwater Source Evaluation

Analyte [(1)]	Units	Maximum Detected Site Conc.		Background Conc. [(2)]		Exceeds Background Conc.?	Potential MC? [(3)]	SLRA Required?	Primary reason for exclusion from SLRA
Metals									
Aluminum	µg/L	**100**	**U**	**100**	U	No	**Yes**	No	Not detected at MRS
Antimony	µg/L	3.0	U	**3.0**	U	No	**Yes**	No	Not detected at MRS
Chromium	µg/L	**5.0**	**U**	**5.0**	U	No	No	No	Not detected at MRS
Copper	µg/L	**9.2**		**54**		No	**Yes**	No	Not detected above background
Lead	µg/L	**2.0**	**U**	**4.8**		No	**Yes**	No	Not detected at MRS
Zinc	µg/L	**59**		**1410**		No	**Yes**	No	Not detected above background

(1) - No explosives or perchlorate were detected in the ambient or biased media samples at this MRS.

(2) - Background concentrations as established in Table 5.6.

(3) - Potential MC as listed in Table 4.1.

Data Qualifiers:

U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.

J - Analyte detected, estimated concentration.

5.4.2.6 Groundwater Migration Pathway Conclusions

Two MC (copper and zinc) were detected in the groundwater sample associated with MRS02. However, the concentrations of these analytes were below the selected background concentrations. Therefore, based on the analytical results presented in this report, potential MC contamination is not present within groundwater at MRS02. Therefore, the groundwater exposure pathway is incomplete for the human receptors using the groundwater medium at MRS02.

5.4.3 Surface Water and Sediment Migration Pathway

Surface water can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the surface water and sediment through runoff and erosion.

5.4.3.1 Hydrologic Setting

There are no major streams or rivers running through the FUDS, but there are several small creeks and tributaries present on the site that empty to major rivers, some of which are within MRS02. The MRS02 hydrology does not differ significantly from the setting described for the overall site in Subchapter 5.2.4.

5.4.3.2 Releases and Potential Releases to Surface Water and Sediment

There are no known releases of MC to surface water or sediment at MRS02. The presence of local surface water provides a potential migration pathway through which releases of MC to soil as a result of munitions activities could migrate to surface water or sediment via runoff or erosion.

5.4.3.3 Surface Water and Sediment Migration Pathways and Receptors

The presence of local surface water provides a potential migration pathway through which releases of MC to soil, as a result of munitions activities, could migrate to surface water or sediment via runoff or erosion. Potential receptors would include current and future residents, commercial and industrial workers, site visitors, recreational users, and ecological receptors.

5.4.3.4 Sample Locations/Methods

No surface water or sediment sampling was conducted for evaluation of MRS02 as per the decision of the TPP Team. Surface soil is considered to be the primary indicator of the potential for MC contamination. Therefore, sampling efforts were primarily focused on that medium.

5.4.3.5 Surface Water and Sediment Analytical Results

No surface water or sediment sampling was conducted for evaluation of MRS02 since surface soil is the medium most likely directly affected by the practice bombing and gunnery activities as per the decision of the TPP Team.

5.4.3.6 Surface Water and Sediment Migration Pathway Conclusions

Surface water and sediment samples were not collected at MRS02 since surface soil is the medium most likely directly affected by the practice bombing and gunnery activities, in accordance with the directions from the TPP Team. None of the MC metals were detected above the selected background concentrations and explosives were not detected in the surface

soil samples collected from the site, as discussed in Subchapter 5.4.4.5. There is not a potential source of MC contamination; therefore, failing to provide an essential element necessary for a complete migration pathway. The surface water and sediment migration pathways for all receptors at MRS02 are incomplete.

5.4.4 Soil Exposure Pathway

Potential soil exposure pathways include incidental ingestion, dermal contact, and inhalation of re-suspended particulates by human and ecological receptors. Ecological receptors may also be exposed through ingestion of biota that have been exposed to MC in soil. Contamination in soil can also leach to groundwater and be transferred to surface water and sediment via runoff and erosion. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil exposed at the ground surface, site-specific geology, climate, and expected future land use.

5.4.4.1 Physical Source Access Conditions

The land is managed for lumber production hunting, with some portions of the land used for residential and small business properties. Public access is primarily unrestricted at MRS02.

5.4.4.2 Actual or Potential Contamination Areas

MRS02 was originally used for strafing practice and skip bombing. As a result, the potential for munitions-related contamination exists within the MRS.

5.4.4.3 Soil Exposure Pathways and Receptors

The MRS02 CSEM is presented in Appendix J. The soil exposure pathway provides for the potential exposure of human and ecological receptors on or near MRS02 who may come into contact with contaminated soil through incidental ingestion, dermal contact, or inhalation of re-suspended particulate matter. Based on the known current and future uses of the land, the potential receptors at the MRS would include current and future residents, commercial and industrial workers, site visitors, recreational users, and ecological receptors. Ecological receptors may also come into contact with MC in the soil by ingestion of biota that have been exposed to MC in soil.

5.4.4.4 Sample Locations/Methods

Two biased surface soil samples (HBGR-MSR03-DU3-SS-02-01 and HBGR-MSR05-DU6-SS-02-01) were collected from locations within MRS02 and the adjusted Multiple Use Target potential AOI boundary, as shown on Figure 5.1. The biased surface soil sample locations were selected to represent the area with the highest likelihood for the presence of MEC or MC contamination (per the SS-WP [Parsons 2008a]).

5.4.4.5 Soil Analytical Results

The analytical results for the surface soil samples associated with MRS02 are presented in Table 5.3. The results were used in the source evaluation (Table 5.10), using the criteria described in Subchapter 5.2.8. No explosives were detected in the surface soil samples, so the source evaluation was performed for MC metals only. Table 5.10 shows that none of the metals (aluminum, antimony, copper, lead, and zinc) were detected at concentrations that exceed their respective selected background concentrations. Although the maximum concentration of chromium exceeded the selected background concentration, this metal is not considered a potential MC (Table 4.1) and therefore does not meet the criteria in Subchapter 5.2.8.

Table 5.10
Multiple Use Target Surface Soil Source Evaluation

Analyte [1]	Units	Maximum Detected Site Conc.		Background Conc. [2]		Exceeds Background Conc.?	Potential MC? [3]	SLRA Required?	Primary reason for exclusion from SLRA
Metals									
Aluminum	mg/kg	**4330**		**55000**		No	**Yes**	No	Not detected above background
Antimony	mg/kg	**0.44**	**J**	**2.3**		No	**Yes**	No	Not detected above background
Chromium	mg/kg	**180**	**J**	**160**		**Yes**	No	No	-Not potential MC
Copper	mg/kg	**3.1**	**J**	**21**		No	**Yes**	No	Not detected above background
Lead	mg/kg	**6.7**	**J**	**51**		No	**Yes**	No	Not detected above background
Zinc	mg/kg	**5.0**	**UJ**	**100**		No	**Yes**	No	Not detected at MRS

(1) - No explosives were detected in the ambient or biased media samples at this MRS.

(2) - Background concentrations as established in Table 5.5.

(3) - Potential MC as listed in Table 4.1.

Data Qualifiers:

U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.

J - Analyte detected, estimated concentration.

5.4.4.6 Soil Exposure Pathway Conclusions

No explosives were detected in surface soil samples from MRS02, and the detected concentrations of all metals analyzed did not exceed their respective selected background concentrations with the exception of chromium. Although the maximum concentration of chromium exceeded the selected background concentration, this metal is not considered a potential MC (Table 4.1) and therefore was not retained for consideration in the Chapter 6 SLRA. Based on the analytical data, surface soil contamination is not indicated to have resulted from munitions-related activities at MRS02. Based on the available current and future land use at the site, the soil exposure pathway is incomplete for these MC metals. Consequently, no MC were retained for further evaluation in a SLRA.

5.4.5 Air Migration Pathway

The air migration pathway accounts for hazardous substance migration in gaseous or particulate form through the air. Inhalation of a contaminant can be a potential exposure pathway for human and ecological receptors. No air sampling was performed and the TPP Team agreed that air sampling would not be performed as part of this SI.

5.4.5.1 Climate

The climate at the site is described in Subchapter 2.2.3.

5.4.5.2 Releases and Potential Releases to Air

There are no known direct releases of MC to air at MRS02. The occurrence of significant windblown dust is unlikely and releases via this pathway are not expected based on the absence of MC contamination in the site soil (Subchapter 5.4.5.5).

5.4.5.3 Air Migration Pathways and Receptors

Because there are no known volatile contaminants at the site, the only remaining air migration pathway would be via the inhalation of fugitive dust. Based on the known current and future uses of the land, the potential receptors would be current and future residents, commercial or industrial workers, and site visitors or recreational users, as well as ecological receptors. These receptors could be exposed to surface soil through inhalation of resuspended particulate matter through the air migration pathway. The CSEM is presented in Appendix J.

5.4.5.4 Sample/Monitoring Locations/Methods

No air sampling is known to have been performed at MRS02 and the TPP Team agreed that air sampling would not be conducted as part of this SI.

5.4.5.5 Air Analytical Results

Not applicable.

5.4.5.6 Air Migration Pathway Conclusions

As discussed in Subchapter 5.4.4, no explosives or metals were detected in the surface soil samples collected; therefore, based on the analytical results presented in this report, there is no source of MC contamination at the site. Consequently, the air migration pathway is incomplete for all receptors at MRS02.

5.5 BOMB TARGET #2 MUNITIONS RESPONSE SITE

5.5.1 This subchapter of the SI Report describes the evaluation of exposure pathways for Bomb Target #2 (MRS03). The analysis of each pathway is based on the analytical results for each medium of concern and the current and future land use information presented in Subchapter 2.2.6. The CSEM for MRS03 is provided in Appendix J.

5.3.2 Today, the MRS03 land is managed for lumber production and hunting. Future land use at MRS03 is expected to remain the same.

5.5.1 Historical Munitions Constituents Information

To date, no data exist to indicate that MC related to the use of ordnance affected MRS03.

5.5.2 Groundwater Migration Pathway

Groundwater can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the groundwater, site-specific geology, climate, and the expected future land use.

5.5.2.1 Geologic and Hydrogeologic Setting

There are no known differences between the geologic and hydrogeologic setting at MRS03 and the setting described for the overall site in Subchapter 5.2.1 and Subchapter 5.2.2.

5.5.2.2 Releases and Potential Releases to Groundwater

There are no known releases or potential releases of MC to groundwater at MRS03. No wells have been identified within the MRS. Should a source of MC contamination exist in the soil, it is possible that MC could leach into shallow groundwater.

5.5.2.3 Groundwater Migration Pathways and Receptors

Table 5.1 summarizes the number and type of wells as well as their distance from the FUDS boundary. None of these wells are known to be within MRS03, as shown on Figure 5.2. Based on the known current and future uses of the land, the potential receptors include commercial and industrial workers, site visitors, and recreational users. It is generally assumed that groundwater is not directly accessible to ecological receptors, due to the inability of these

receptors to interact with groundwater. Therefore, the groundwater exposure pathway is incomplete for ecological receptors.

5.5.2.4 Groundwater Sample Locations/Methods

Groundwater samples were not collected within MRS03.

5.5.2.5 Groundwater Analytical Results

Groundwater samples were not collected within MRS03.

5.5.2.6 Groundwater Migration Pathway Conclusions

Due to the absence of groundwater wells within MRS03 and the absence of a source of MC contamination in the surface soil, as described is Subchapter 5.5.4, groundwater exposure pathways are incomplete for all receptors present at MRS03.

5.5.3 Surface Water and Sediment Migration Pathway

Surface water can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the surface water and sediment through runoff and erosion.

5.5.3.1 Hydrologic Setting

There are no major streams or rivers running through Hammond Bombing and Gunnery Range, but there are several small creeks and tributaries present on the site that empty to major rivers. The BT2 MRS03 hydrology does not differ significantly from the setting described for the overall site in Subchapter 5.2.4.

5.5.3.2 Releases and Potential Releases to Surface Water and Sediment

There are no known releases of MC to surface water or sediment at MRS03. The presence of local surface water provides a potential migration pathway through which releases of MC to soil as a result of munitions activities could migrate to surface water or sediment via runoff or erosion.

5.5.3.3 Surface Water and Sediment Migration Pathways and Receptors

The presence of local surface water provides a potential migration pathway through which releases of MC to soil, as a result of munitions activities, could migrate to surface water or sediment via runoff or erosion. Potential receptors would include commercial and industrial workers, site visitors, recreational users and ecological receptors.

5.5.3.4 Sample Locations/Methods

The TPP Team decided that no surface water or sediment sampling would be conducted for evaluation of MRS03. Releases of MC due to munitions activity would be primarily to surface soil. Therefore, sampling efforts were primarily focused on that medium.

5.5.3.5 Surface Water and Sediment Analytical Results

No surface water or sediment sampling was conducted for evaluation of MRS03 as per the decision of the TPP Team.

5.5.3.6 Surface Water and Sediment Migration Pathway Conclusions

Surface water and sediment were not collected at MRS03 in accordance with the directions from the TPP Team. None of the MC metals were detected above the selected background concentrations and explosives were not detected in the surface soil sample collected from MRS03, as discussed in Subchapter 5.5.4.5. Therefore, there is not a potential source of MC contamination. This fails to provide an essential element necessary for a complete migration pathway. The surface water and sediment migration pathways for all receptors at MRS03 are incomplete.

5.5.4 Soil Exposure Pathway

Potential soil exposure pathways include incidental ingestion, dermal contact, and inhalation of re-suspended particulates by human and ecological receptors. Ecological receptors may also be exposed through ingestion of biota that have been exposed to MC in soil. Contamination in soil can also leach to groundwater and be transferred to surface water and sediment via runoff and erosion. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil exposed at the ground surface, site-specific geology, climate, and expected future land use.

5.5.4.1 Physical Source Access Conditions

The MRS03 land is managed for lumber production and hunting. Public access is primarily unrestricted.

5.5.4.2 Actual or Potential Contamination Areas

MRS03 was originally used as a bombing target. As a result, the potential for munitions-related contamination exists within the MRS.

5.5.4.3 Soil Exposure Pathways and Receptors

The MRS03 CSEM is presented in Appendix J. The soil exposure pathway provides for the potential exposure of human and ecological receptors on or near MRS03 who may come into contact with contaminated soil through incidental ingestion, dermal contact, or inhalation of re-suspended particulate matter. Based on the known current and future uses of the land, the

potential receptors at the MRS would include commercial and industrial workers, site visitors, recreational users, and ecological receptors. Ecological receptors may also come into contact with MC in the soil by ingestion of biota that have been exposed to MC in soil.

5.5.4.4 Sample Locations/Methods

One biased surface soil sample (HBGR-MRS02-DU2-SS-02-01) was collected within MRS03, as shown on Figure 5.1. The biased surface soil sample location was selected to represent the area with the highest likelihood for the presence of MEC or MC contamination (per the SS-WP [Parsons 2008a]).

5.5.4.5 Soil Analytical Results

The analytical results for the surface soil sample collected from MRS03 are presented in Table 5.3. The results were used in the source evaluation (Table 5.11), using the criteria described in Subchapter 5.2.8. No explosives were detected in the surface soil sample, so the source evaluation was performed for MC metals only. Table 5.11 shows that none of the metals (aluminum, antimony, chromium, copper, lead, and zinc) were detected at concentrations that exceed their respective selected background concentrations.

Table 5.11
Bomb Target #2 Surface Soil Source Evaluation

Analyte [1]	Units	Maximum Detected Site Conc.		Background Conc. [2]		Exceeds Background Conc.?	Potential MC? [3]	SLRA Required?	Primary reason for exclusion from SLRA
Metals									
Aluminum	mg/kg	**4400**		**55000**		No	**Yes**	No	Not detected above background
Antimony	mg/kg	**0.20**	**UJ**	**2.3**		No	**Yes**	No	Not detected at MRS
Chromium	mg/kg	**4.5**	**J**	**160**		No	No	No	Not detected above background
Copper	mg/kg	**1.9**	**J**	**21**		No	**Yes**	No	Not detected above background
Lead	mg/kg	**5.4**	**J**	**51**		No	**Yes**	No	Not detected above background
Zinc	mg/kg	**5.0**	**UJ**	**100**		No	**Yes**	No	Not detected at MRS
(1) - No explosives were detected in the ambient or biased media samples at this MRS.									
(2) - Background concentrations as established in Table 5.5.									
(3) - Potential MC as listed in Table 4.1.									
Data Qualifiers:									
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.									
J - Analyte detected, estimated concentration.									

5.5.4.6 Soil Exposure Pathway Conclusions

No explosives were detected in the surface soil sample collected from MRS03, and the detected concentrations of all metals analyzed did not exceed their respective selected background concentrations. Based on the analytical data, surface soil contamination is not indicated to have resulted from munitions-related activities at MRS03. Based on the available current and future land use at the site, the soil exposure pathway is incomplete for these MC metals. Consequently, no MC were retained for further evaluation in a SLRA.

5.5.5 Air Migration Pathway

The air migration pathway accounts for hazardous substance migration in gaseous or particulate form through the air. Inhalation of a contaminant can be a potential exposure pathway for human and ecological receptors. No air sampling was performed and the TPP Team agreed that air sampling would not be performed as part of this SI.

5.5.5.1 Climate

The climate at the site is described in Subchapter 2.2.3.

5.5.5.2 Releases and Potential Releases to Air

There are no known direct releases of MC to air at MRS03. The occurrence of significant windblown dust is unlikely and releases via this pathway are not expected based on the absence of MC contamination in the site soil (Subchapter 5.5.5.5).

5.5.5.3 Air Migration Pathways and Receptors

Because there are no known volatile contaminants at the site, the only remaining air migration pathway would be via the inhalation of fugitive dust. Based on the known current and future uses of the land, the potential receptors at MRS03 would be commercial or industrial workers, and site visitors or recreational users, as well as ecological receptors. These receptors could be exposed to surface soil through inhalation of resuspended particulate matter through the air migration pathway. The CSEM is presented in Appendix J.

5.5.5.4 Sample/Monitoring Locations/Methods

No air sampling is known to have been performed at MRS03 and the TPP Team agreed that air sampling would not be conducted as part of this SI.

5.5.5.5 Air Analytical Results

Not applicable.

5.5.5.6 Air Migration Pathway Conclusions

As discussed in Subchapter 5.5.4, no explosives or metals were detected above background concentrations in the surface soil sample collected; therefore, based on the analytical results presented in this report, there is no source of MC contamination at MRS03. Consequently, the air migration pathway is incomplete for all receptors at MRS03.

5.6 RIFLE RANGE MUNITIONS RESPONSE SITE

5.6.1 This subchapter of the SI Report describes the evaluation of exposure pathways for the Rifle Range MRS (MRS04). The analysis of each pathway is based on the analytical results for each medium of concern and the current and future land use information presented in Subchapter 2.2.6. The CSEM for MRS04 is provided in Appendix J.

5.6.2 Today, the MRS04 land is managed for lumber production and hunting. Future land use at this site is expected to remain the same.

5.6.1 Historical Munitions Constituents Information

To date, no data exist to indicate that MC related to the use of ordnance affected MRS04.

5.6.2 Groundwater Migration Pathway

Groundwater can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the groundwater, site-specific geology, climate, and the expected future land use.

5.6.2.1 Geologic and Hydrogeologic Setting

There are no known differences between the geologic and hydrogeologic setting at MRS04 and the setting described for the overall site in Subchapter 5.2.1 and Subchapter 5.2.2.

5.6.2.2 Releases and Potential Releases to Groundwater

There are no known releases or potential releases of MC to groundwater at MRS04. No wells have been identified within the MRS. It is possible that MC potentially present in the soil at MRS04 could leach into shallow groundwater.

5.6.2.3 Groundwater Migration Pathways and Receptors

Table 5.1 summarizes the number and type of wells as well as their distance from the FUDS boundary. None of these wells are within MRS04, as shown on Figure 5.2. Based on the known current and future uses of the land, the potential receptors include commercial and industrial workers, site visitors, and recreational users. Groundwater wells are not known to exist within MRS04. It is generally assumed that groundwater is not directly accessible to ecological receptors, due to the inability of these receptors to interact with groundwater. Therefore, the groundwater exposure pathway is incomplete for ecological receptors.

5.6.2.4 Groundwater Sample Locations/Methods

Groundwater samples were collected at the locations displayed on Figure 5.1 using the methods stated in the SS-WP (Parsons 2008a). One biased groundwater sample (HBGR-GW-02) was collected near MRS04. Due to the location of the sampled well associated with MRS04 (just east of the MRS04 firing point), groundwater within this well could have also been affected by munitions activities at MRS02 (Multiple Use Target) and MRS05 (Gunnery Range). Therefore, the same groundwater sample is used to evaluate groundwater at all three MRSs. The sample was analyzed for metals (Method SW6010B), explosives (Method SW8330B), and perchlorate (SW6850).

5.6.2.5 Groundwater Analytical Results

The analytical results for the groundwater sample collected near MRS04 are presented in Table 5.4. These results were evaluated using the criteria described in Subchapter 5.2.8. No explosives or perchlorate were detected in the groundwater sample, so this evaluation was performed for metals only. The source evaluation for groundwater is summarized in Table 5.9. As shown in this table, two of the MC (copper and zinc) were detected in the groundwater

sample. When compared to the selected background concentrations identified in Table 5.6, all detected MC analytes were below the background concentrations. Therefore, based on these sample results, munitions-related MC contamination is not present in the groundwater at MRS04.

5.6.2.6 Groundwater Migration Pathway Conclusions

Two MC (copper and zinc) were detected in the groundwater sample associated with MRS04. However the concentrations of these analytes were below the selected background concentrations. Therefore, based on the analytical results presented in this report, potential MC contamination is not present within groundwater near MRS04. Therefore, the groundwater exposure pathway is incomplete for the human receptors using the groundwater medium at MRS04.

5.6.3 Surface Water and Sediment Migration Pathway

Surface water can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the surface water and sediment through runoff and erosion.

5.6.3.1 Hydrologic Setting

There are no major streams or rivers running through the FUDS, but there are several small creeks and tributaries present on the site that empty to major rivers. The MRS04 hydrology does not differ significantly from the setting described for the overall site in Subchapter 5.2.4.

5.6.3.2 Releases and Potential Releases to Surface Water and Sediment

There are no known releases of MC to surface water or sediment at MRS04. The presence of local surface water provides a potential migration pathway through which releases of MC to soil as a result of munitions activities could migrate to surface water or sediment via runoff or erosion.

5.6.3.3 Surface Water and Sediment Migration Pathways and Receptors

The presence of local surface water provides a potential migration pathway through which releases of MC to soil as a result of munitions activities could migrate to surface water or sediment via runoff or erosion. Potential receptors would include commercial and industrial workers, site visitors, recreational users and ecological receptors.

5.6.3.4 Sample Locations/Methods

No surface water or sediment sampling was conducted for evaluation of MRS04 as per the decision of the TPP Team. Surface soil is considered to be the primary indicator of the potential for MC contamination. Therefore, sampling efforts were primarily focused on that medium.

5.6.3.5 Surface Water and Sediment Analytical Results

No surface water or sediment sampling was conducted for evaluation of MRS04 as per the decision of the TPP Team.

5.6.3.6 Surface Water and Sediment Migration Pathway Conclusions

Surface water was not collected at MRS04, in accordance with the directions from the TPP Team. None of the MC metals were detected above the selected background concentrations and explosives were not detected in the surface soil samples collected from the site, as discussed in Subchapter 5.6.4.5. There is not a potential source of MC contamination, failing to provide an essential element necessary for a complete migration pathway. Therefore, the surface water and sediment migration pathways for all receptors at MRS04 are incomplete.

5.6.4 Soil Exposure Pathway

Potential soil exposure pathways include incidental ingestion, dermal contact, and inhalation of re-suspended particulates by human and ecological receptors. Ecological receptors may also be exposed through ingestion of biota that have been exposed to MC in soil. Contamination in soil can also leach to groundwater and be transferred to surface water and sediment via runoff and erosion. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil exposed at the ground surface, site-specific geology, climate, and expected future land use.

5.6.4.1 Physical Source Access Conditions

The MRS04 land is managed for lumber production and hunting. Public access is primarily unrestricted at MRS04.

5.6.4.2 Actual or Potential Contamination Areas

MRS04 was used as a small arms range. As a result, the potential for munitions-related contamination exists within the MRS.

5.6.4.3 Soil Exposure Pathways and Receptors

The MRS04 CSEM is presented in Appendix J. The soil exposure pathway provides for the potential exposure of human and ecological receptors on or near MRS04 who may come into contact with contaminated soil through incidental ingestion, dermal contact, or inhalation of re-suspended particulate matter. Based on the known current and future uses of the land, the potential receptors at the MRS would include commercial and industrial workers, site visitors, recreational users, and ecological receptors. Ecological receptors may also come into contact with MC in the soil by ingestion of biota that have been exposed to MC in soil.

5.6.4.4 Sample Locations/Methods

One biased surface soil sample (HBGR-MSR04-DU4-SS-02-01) was collected within MRS04, as shown on Figure 5.1. The biased surface soil sample location was selected to represent the area with the highest likelihood for the presence of MEC or MC contamination (per the SS-WP [Parsons 2008a]).

5.6.4.5 Soil Analytical Results

The analytical results for the surface soil sample collected from MRS04 are presented in Table 5.3. The results were used in the source evaluation (Table 5.12), using the criteria described in Subchapter 5.2.8. No explosives were detected in the surface soil sample, so the source evaluation was performed for MC metals only. Table 5.12 shows that none of the metals (aluminum, antimony, chromium, copper, lead, and zinc) were detected at concentrations that exceed their respective selected background concentrations.

Table 5.12
Rifle Range Surface Soil Source Evaluation

Analyte [1]	Units	Maximum Detected Site Conc.		Background Conc. [2]		Exceeds Background Conc.?	Potential MC? [3]	SLRA Required?	Primary reason for exclusion from SLRA
Metals									
Aluminum	mg/kg	**5130**		**55000**		No	**Yes**	No	Not detected above background
Antimony	mg/kg	**0.20**	**UJ**	**2.3**		No	**Yes**	No	Not detected at MRS
Chromium	mg/kg	**7.8**	**J**	**160**		No	No	No	Not detected above background
Copper	mg/kg	**3.8**	**J**	**21**		No	**Yes**	No	Not detected above background
Lead	mg/kg	**9.2**	**J**	**51**		No	**Yes**	No	Not detected above background
Zinc	mg/kg	**5.8**	**UJ**	**100**		No	**Yes**	No	Not detected at MRS
(1) - No explosives were detected in the ambient or biased media samples at this MRS.									
(2) - Background concentrations as established in Table 5.5.									
(3) - Potential MC as listed in Table 4.1.									
Data Qualifiers:									
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.									
J - Analyte detected, estimated concentration.									

5.6.4.6 Soil Exposure Pathway Conclusions

No explosives were detected in the surface soil sample from MRS04, and the detected concentrations of all metals analyzed did not exceed their respective selected background concentrations. Based on the analytical data, surface soil contamination is not indicated to have resulted from munitions-related activities at MRS04. Based on the available current and future land use at the site, the soil exposure pathway is incomplete for these MC metals. Consequently, no MC were retained for further evaluation in a SLRA.

5.6.5 Air Migration Pathway

The air migration pathway accounts for hazardous substance migration in gaseous or particulate form through the air. Inhalation of a contaminant can be a potential exposure pathway for human and ecological receptors. No air sampling was performed and the TPP Team agreed that air sampling would not be performed as part of this SI.

5.6.5.1 Climate

The climate at the site is described in Subchapter 2.2.3.

5.6.5.2 Releases and Potential Releases to Air

There are no known direct releases of MC to air at MRS04. The occurrence of significant windblown dust is unlikely and releases via this pathway are not expected based on the absence of MC contamination in the site soil (Subchapter 5.6.5.5).

5.6.5.3 Air Migration Pathways and Receptors

Because there are no known volatile contaminants at the site, the only remaining air migration pathway would be via the inhalation of fugitive dust. Based on the known current and future uses of the land, the potential receptors at MRS04 would be commercial or industrial workers, and site visitors or recreational users, as well as ecological receptors. These receptors could be exposed to surface soil through inhalation of resuspended particulate matter through the air migration pathway. The MRS04 CSEM is presented in Appendix J.

5.6.5.4 Sample/Monitoring Locations/Methods

No air sampling is known to have been performed at MRS04 and the TPP Team agreed that air sampling would not be conducted as part of this SI.

5.6.5.5 Air Analytical Results

Not applicable.

5.6.5.6 Air Migration Pathway Conclusions

As discussed in Subchapter 5.6.4, no explosives or metals were detected above background concentrations in the surface soil samples collected and, therefore, there is no source of MC contamination at the site. Consequently, the air migration pathway is incomplete for all receptors at MRS04.

5.7 GUNNERY RANGE MUNITIONS RESPONSE SITE

5.7.1 This subchapter of the SI Report describes the evaluation of exposure pathways for the Gunnery Range MRS (MRS05). The analysis of each pathway is based on the analytical results for each medium of concern and the current and future land use information presented in Subchapter 2.2.6. The CSEM for MRS05 is provided in Appendix J.

5.7.2 The MRS05 land is managed for lumber production and hunting. Future land use at this site is expected to remain the same.

5.7.1 Historical Munitions Constituents Information

To date, no data exist to indicate that MC related to the use of ordnance affected MRS05.

5.7.2 Groundwater Migration Pathway

Groundwater can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the groundwater, site-specific geology, climate, and the expected future land use.

5.7.2.1 Geologic and Hydrogeologic Setting

There are no known differences between the geologic and hydrogeologic setting at MRS05 and the setting described for the overall site in Subchapter 5.2.1 and Subchapter 5.2.2.

5.7.2.2 Releases and Potential Releases to Groundwater

There are no known releases or potential releases of MC to groundwater at MRS05. Wells have not been identified within the MRS. It is possible that MC potentially present in the soil could leach into shallow groundwater.

5.7.2.3 Groundwater Migration Pathways and Receptors

Table 5.1 summarizes the number and type of wells as well as their distance from the FUDS boundary. None of these wells are within MRS05, as shown on Figure 5.2. Based on the known current and future uses of the land, the potential receptors include commercial and industrial workers, site visitors, and recreational users. Groundwater wells are not known to exist within MRS05. It is generally assumed that groundwater is not directly accessible to ecological receptors, due to the inability of these receptors to interact with groundwater. Therefore, the groundwater exposure pathway is incomplete for ecological receptors.

5.7.2.4 Groundwater Sample Locations/Methods

Groundwater samples were collected at the locations displayed on Figure 5.1 using the methods stated in the SS-WP (Parsons 2008a). One biased groundwater sample (HBGR-GW-02) was collected near MRS05. Due to the location of the sampled well associated with MRS05 (just east of range), groundwater within this well could have also been affected by munitions activities occurring in MRS02 (Multiple Use Target) and MRS04 (Rifle Range). Therefore, the same groundwater sample is used to evaluate groundwater for all three MRSs. The sample was analyzed for metals (Method SW6010B), explosives (Method SW8330B), and perchlorate (SW6850).

5.7.2.5 Groundwater Analytical Results

The analytical results for the groundwater sample associated with MRS05 are presented in Table 5.4. These results were evaluated using the criteria described in Subchapter 5.2.8. No explosives or perchlorate were detected in the groundwater sample, so this evaluation was performed for metals only. The source evaluation for groundwater is summarized in Table 5.9. As shown in this table, two of the MC (copper and zinc) were detected in the groundwater

sample. When compared to the selected background concentrations identified in Table 5.6, all detected MC analytes were below the background concentrations. Therefore, based on these sample results, munitions-related MC contamination is not identified in the groundwater at MRS05.

5.7.2.6 Groundwater Migration Pathway Conclusions

Two MC (copper and zinc) were detected in the groundwater sample associated with MRS05. However, the concentrations of these analytes were below the selected background concentrations. Therefore, based on the analytical results presented in this report, potential MC contamination is not present within groundwater near MRS05. Therefore, the groundwater exposure pathway is incomplete for the human receptors using the groundwater medium at MRS05.

5.7.3 Surface Water and Sediment Migration Pathway

Surface water can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas, such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the surface water and sediment through runoff and erosion.

5.7.3.1 Hydrologic Setting

There are no major streams or rivers running through the FUDS, but there are several small creeks and tributaries present on the site that empty to major rivers. The MRS05 hydrology does not differ significantly from the setting described for the overall site in Subchapter 5.2.4.

5.7.3.2 Releases and Potential Releases to Surface Water and Sediment

There are no known releases of MC to surface water or sediment at MRS05. The presence of local surface water provides a potential migration pathway through which releases of MC to soil as a result of munitions activities could migrate to surface water or sediment via runoff or erosion.

5.7.3.3 Surface Water and Sediment Migration Pathways and Receptors

The presence of local surface water provides a potential migration pathway through which releases of MC to soil as a result of munitions activities could migrate to surface water or sediment via runoff or erosion. Potential receptors would include commercial and industrial workers, site visitors, recreational users and ecological receptors.

5.7.3.4 Sample Locations/Methods

No surface water or sediment sampling was conducted for evaluation of MRS05 as per the decision of the TPP Team. Surface soil is considered to be the primary indicator of the potential for MC contamination. Therefore, sampling efforts were primarily focused on that medium.

5.7.3.5 Surface Water and Sediment Analytical Results

No surface water or sediment sampling was conducted for evaluation of MRS05 as per the decision of the TPP Team.

5.7.3.6 Surface Water and Sediment Migration Pathway Conclusions

Surface water and sediment were not collected at MRS05, in accordance with the directions from the TPP Team. None of the MC metals were detected above the selected background concentrations and explosives were not detected in the surface soil sample collected from the site, as discussed in Subchapter 5.7.4.5. Therefore, there is not a potential source of MC contamination, failing to provide an essential element necessary for a complete migration pathway. Therefore, the surface water and sediment migration pathways for all receptors at MRS05 are incomplete.

5.7.4 Soil Exposure Pathway

Potential soil exposure pathways include incidental ingestion, dermal contact, and inhalation of re-suspended particulates by human and ecological receptors. Ecological receptors may also be exposed through ingestion of biota that have been exposed to MC in soil. Contamination in soil can also leach to groundwater and be transferred to surface water and sediment via runoff and erosion. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil exposed at the ground surface, site-specific geology, climate, and expected future land use.

5.7.4.1 Physical Source Access Conditions

The MRS05 land is managed for lumber production and hunting. Public access is primarily unrestricted at MRS05.

5.7.4.2 Actual or Potential Contamination Areas

MRS05 was originally used as an aircraft gunnery range. As a result, the potential for munitions-related contamination exists within the MRS.

5.7.4.3 Soil Exposure Pathways and Receptors

The MRS05 CSEM is presented in Appendix J. The soil exposure pathway provides for the potential exposure of human and ecological receptors on or near MRS05 who may come into contact with contaminated soil through incidental ingestion, dermal contact, or inhalation of resuspended particulate matter. Based on the known current and future uses of the land, the potential receptors at the MRS would include commercial and industrial workers, site visitors, recreational users, and ecological receptors. Ecological receptors may also come into contact with MC in the soil by ingestion of biota that have been exposed to MC in soil.

5.7.4.4 Sample Locations/Methods

One biased surface soil sample (HBGR-MRS05-DU5-SS-02-01) was collected within MRS05, as shown on Figure 5.1. The biased surface soil sample location was selected to represent the area with the highest likelihood for the presence of MEC or MC contamination (per the SS-WP [Parsons 2008a]).

5.7.4.5 Soil Analytical Results

The analytical results for the surface soil sample collected from MRS05 are presented in Table 5.3. The results were used in the source evaluation (Table 5.13), using the criteria described in Subchapter 5.2.8. No explosives were detected in the surface soil sample, so the source evaluation was performed for MC metals only. Table 5.13 shows that none of the metals (aluminum, antimony, chromium, copper, lead, and zinc) were detected at concentrations that exceed their respective selected background concentrations.

Table 5.13
Gunnery Range Surface Soil Source Evaluation

Analyte [1]	Units	Maximum Detected Site Conc.		Background Conc. [2]		Exceeds Background Conc.?	Potential MC? [3]	SLRA Required?	Primary reason for exclusion from SLRA
Metals									
Aluminum	mg/kg	**4480**		**55000**		No	**Yes**	No	Not detected above background
Antimony	mg/kg	**0.44**	**J**	**2.3**		No	**Yes**	No	Not detected above background
Chromium	mg/kg	**5.0**	**J**	**160**		No	No	No	Not detected above background
Copper	mg/kg	**4.5**	**J**	**21**		No	**Yes**	No	Not detected above background
Lead	mg/kg	**5.3**	**J**	**51**		No	**Yes**	No	Not detected above background
Zinc	mg/kg	**5.0**	**UJ**	**100**		No	**Yes**	No	Not detected at MRS
(1) - No explosives were detected in the ambient or biased media samples at this MRS.									
(2) - Background Concentrations as established in Table 5.5.									
(3) - Potential MC as listed in Table 4.1									
Data Qualifiers:									
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.									
J - Analyte detected, estimated concentration.									

5.7.4.6 Soil Exposure Pathway Conclusions

No explosives were detected in the surface soil sample from MRS05, and the detected concentrations of all metals analyzed did not exceed their respective selected background concentrations. Based on the analytical data, surface soil contamination is not indicated to have resulted from munitions-related activities at MRS05. Based on the available current and future land use at the site, the soil exposure pathway is incomplete for these MC metals. Consequently, no MC were retained for further evaluation in a SLRA.

5.7.5 Air Migration Pathway

The air migration pathway accounts for hazardous substance migration in gaseous or particulate form through the air. Inhalation of a contaminant can be a potential exposure pathway for human and ecological receptors. No air sampling was performed and the TPP Team agreed that air sampling would not be performed as part of this SI.

5.7.5.1 Climate

The climate at the site is described in Subchapter 2.2.3.

5.7.5.2 Releases and Potential Releases to Air

There are no known direct releases of MC to air at MRS05. The occurrence of significant windblown dust is unlikely and releases via this pathway are not expected based on the absence of MC contamination in the site soil (Subchapter 5.7.5.5).

5.7.5.3 Air Migration Pathways and Receptors

Because there are no known volatile contaminants at the site, the only remaining air migration pathway would be via the inhalation of fugitive dust. Based on the known current and future uses of the land, the potential receptors at MRS05 would be commercial or industrial workers, and site visitors or recreational users, as well as ecological receptors. These receptors could be exposed to surface soil through inhalation of resuspended particulate matter through the air migration pathway. The CSEM is presented in Appendix J.

5.7.5.4 Sample/Monitoring Locations/Methods

No air sampling is known to have been performed at MRS05 and the TPP Team agreed that air sampling would not be conducted as part of this SI.

5.7.5.5 Air Analytical Results

Not applicable.

5.7.5.6 Air Migration Pathway Conclusions

As discussed in Subchapter 5.7.4, no metals were detected above background concentrations and no explosives were detected in the soil samples collected; therefore, based on the results presented in this report, there is no source of MC contamination at the site. Consequently, the air migration pathway is incomplete for all receptors at MRS05.

5.8 POTENTIAL AREA OF INTEREST (AREA OF POTENTIAL CRATERING)

This subchapter of the SI Report describes the evaluation of exposure pathways for the area of potential cratering AOI. The review of pathways is based on the analytical results collected and the current and future land use information presented in Subchapter 2.2.6. The area of potential cratering AOI land is managed for lumber production and hunting. Future land use is expected to remain the same.

5.8.1 Historical Munitions Constituents Information

This AOI is reported to have cratering based on anecdotal information from the Tangipahoa Sheriff. To date, no data exist to indicate that MC related to the use of ordnance affected the AOI. The current landowner explained that tree stump blasting activities may have recently occurred (late 1990's) in this area for the purpose of turpentine harvesting. The landowner believes this may have contributed to explosives contamination in the area.

5.8.2 Groundwater Migration Pathway

There are no known releases or potential releases of MC to groundwater at the AOI. None of the identified wells are within the AOI, as shown on Figure 5.2. It is generally assumed that groundwater is not directly accessible to human or ecological receptors, due to the inability of these receptors to interact with groundwater. Therefore, the groundwater exposure pathway is incomplete for human and ecological receptors.

5.8.3 Surface Water and Sediment Migration Pathway

Surface water was not collected at the AOI nor are there any major streams or rivers running through the AOI.. None of the MC metals were detected above the selected background concentrations in the surface soil samples collected from the site, as discussed under Subchapter 5.8.4. There is a potential source of explosive (nitroglycerin) MC contamination in the surface soil. Therefore, it is anticipated that the surface water and sediment migration pathways for all receptors at the AOI are potentially incomplete.

5.8.4 Soil Exposure Pathway

5.8.4.1 One biased surface soil sample (HBGR-AOC-DU7-SS-02-01) was collected at the area of potential cratering AOI, as shown on Figure 5.1. The biased surface soil sample location was selected to represent the area with the highest likelihood for the presence of MEC or MC contamination (per the SS-WP [Parsons 2008a]). The analytical results for the surface soil sample collected from the AOI are presented in Table 5.3. The results were used in the source evaluation (Table 5.14), using the criteria described in Subchapter 5.2.8. Table 5.14 shows that none of the metals (aluminum, antimony, chromium, copper, lead, and zinc) were detected at concentrations that exceed their respective selected background concentrations. One explosive (nitroglycerin) was detected in the surface soil sample at an estimated concentration of 0.31 mg/kg, indicating that a potential release of MC due to munitions activities may have occurred at this site.

5.8.4.2 The area of potential cratering AOI is not shown in historical documents for the site. No ranges or other military features are documented in this area. Deputy Sheriff Tom Davidson, of the Tangipahoa Sheriff Department, indicated that he has observed craters in this area. The SI team did not observe any craters, MEC, or MD in this area.

Table 5.14
Potential Area of Interest Surface Soil Source Evaluation

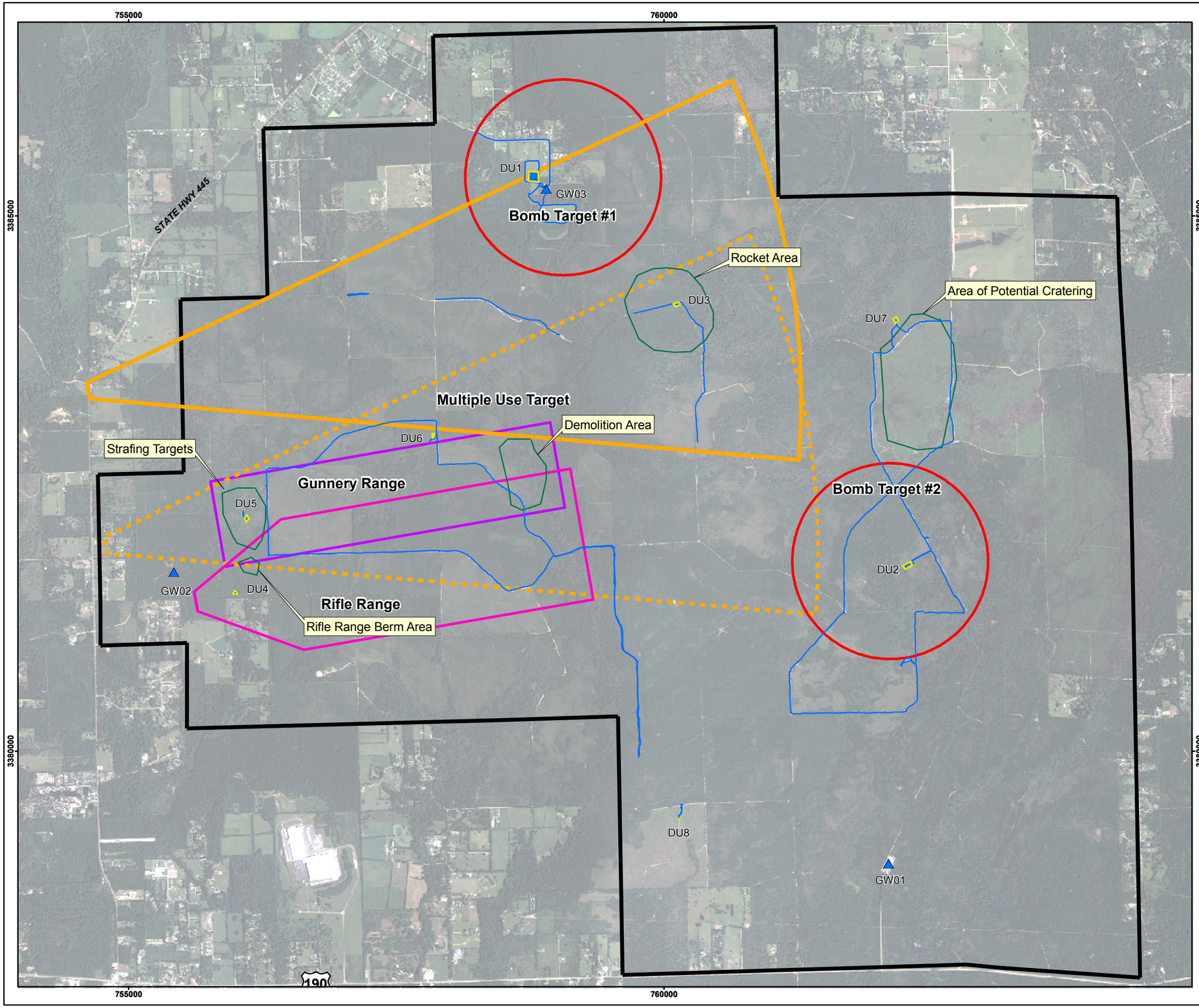
Analyte [1]	Units	Maximum Detected Site Conc.		Background Conc. [2]		Exceeds Background Conc.?	Potential MC? [3]
Metals							
Aluminum	mg/kg	**4110**		**55000**		No	**Yes**
Antimony	mg/kg	0.22	UJ	**2.3**		No	**Yes**
Chromium	mg/kg	**4.5**	**J**	**160**		No	No
Copper	mg/kg	**2.0**	**J**	**21**		No	**Yes**
Lead	mg/kg	**4.9**	**J**	**51**		No	**Yes**
Zinc	mg/kg	**5.0**	**UJ**	**100**		No	**Yes**
(1) - No other explosives were detected in the ambient or biased media samples at this PAOI.							
(2) - Background concentrations as established in Table 5.5.							
(3) - Potential MC as listed in Table 4.1.							
Data Qualifiers:							
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit.							
J - Analyte detected, estimated concentration.							

Figure 5.1

Qualitative Reconnaissance and Sample Locations

Hammond Bombing and Gunnery Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Groundwater Sample Location
- Qualitative Reconnaissance Track
- Decision Unit
- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary
- Adjusted Location of Multiple Use Target Based on Stakeholder Information
- Area of Potential Cratering AOI

Site Location in Louisiana

N

Image Source: Orthophoto, 2006
Projection: UTM Zone 15 NAD83, Map Units in Meters

3,000 1,500 0 3,000 Feet

PARSONS

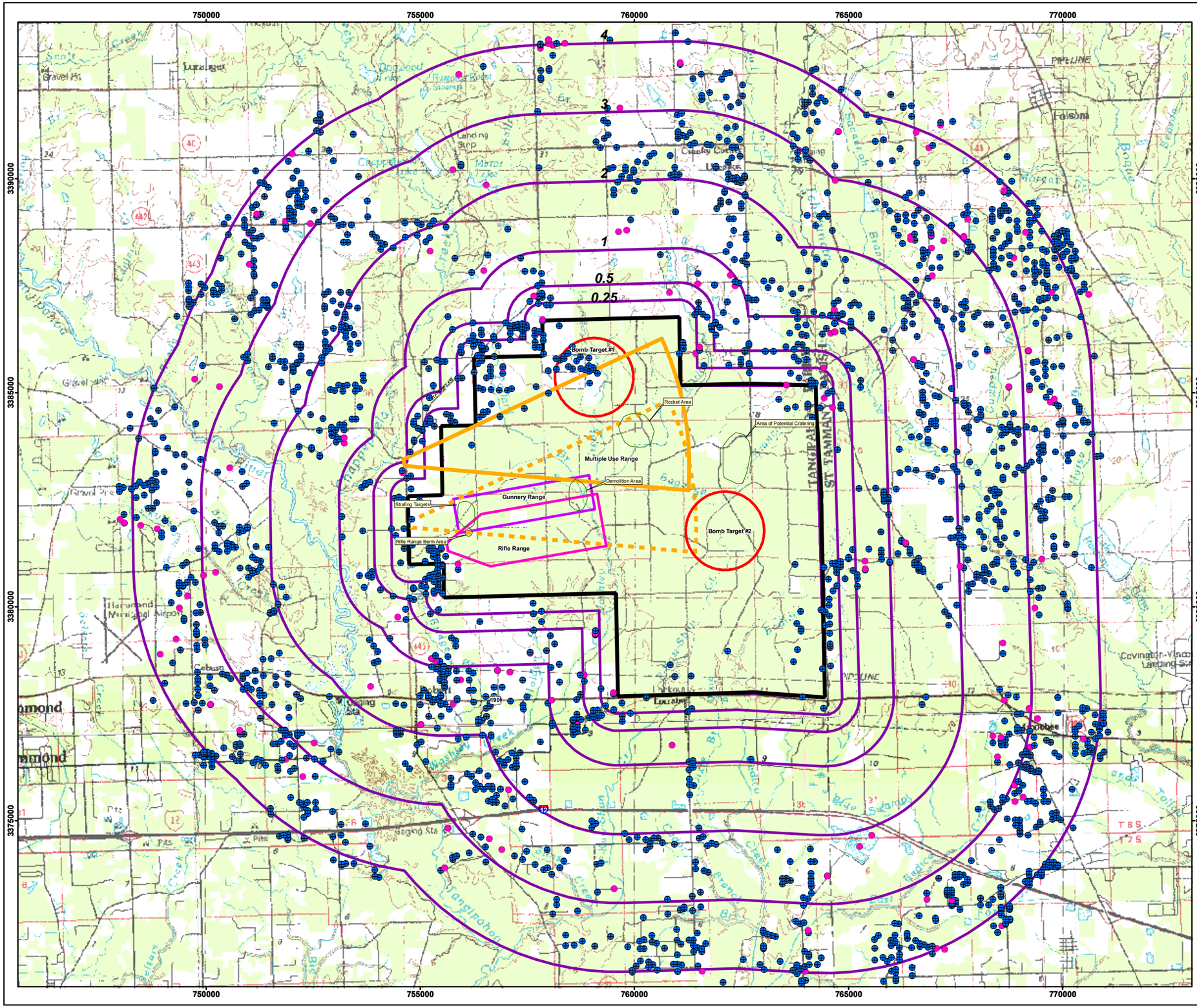
U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	Qualitative Reconnaissance and Sample Locations
DRAWN BY: BT	
CHECKED BY: JB	SCALE: As Shown; PROJECT NUMBER: 744653.84115
SUBMITTED BY: DS	DATE: June 2009; PAGE NUMBER: 5-44
	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig5_1.mxd

Figure 5.2

Water Wells within 4-Mile Buffer
Hammond Bombing and Gunnery Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Other Well
- Drinking Water Well
- Bombing Target
- Gunnery Range
- Multiple Use Target (as shown in ASR Supplement)
- Rifle Range
- FUDS Property Boundary
- Adjusted Location of Multiple Use Target Based on Stakeholder Information
- Buffer (Mile)
- Area of Potential Cratering AOI

Site Location in Louisiana

Image Source: USGS Topos, 1983
Projection: UTM Zone 15 NAD83, Map Units in Meters

N

2 1 0 2 Miles

PARSONS	U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

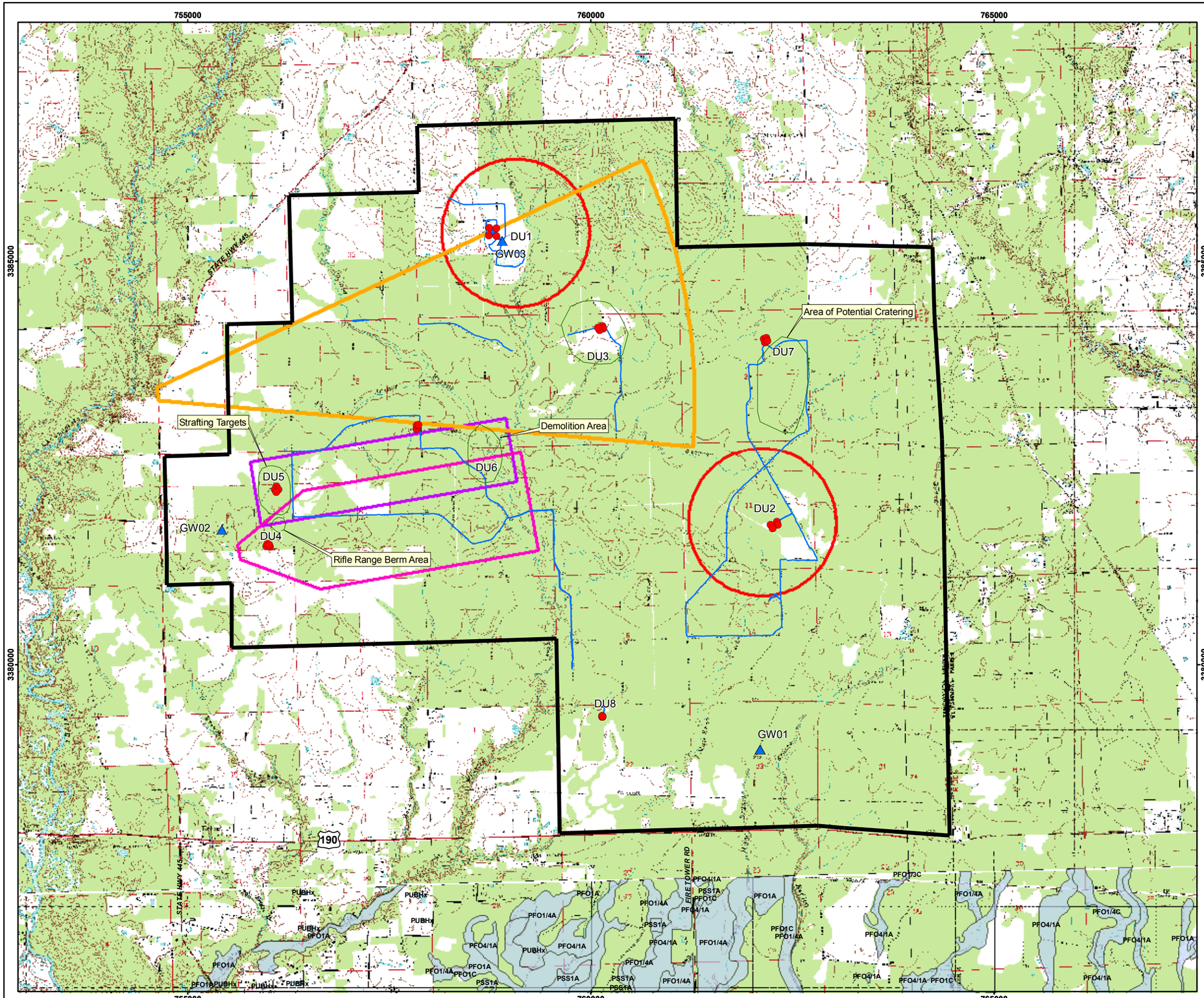
DESIGNED BY: BT	**Water Wells within 4-Mile Buffer**		
DRAWN BY: BT			
CHECKED BY: JB	SCALE: As Shown	PROJECT NUMBER: 744653.84115	
SUBMITTED BY: DS	DATE: June 2009	PAGE NUMBER: 5-45	
	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig5_2.mxd		

Figure 5.3

Wetlands

Hammond Bombing Ranges
FUDS Project No. A06LA030901

Tangipahoa Parish, Louisiana



Legend

- Surface Soil Sample Location (Decision Unit)
- Groundwater Sample Location
- Qualitative Reconnaissance Track
- Bombing Target
- Gunnery Range
- Multiple Use Target
- Rifle Range
- FUDS Property Boundary
- Area of Potential Cratering AOI
- Wetland (Obtained from U.S. Fish & Wildlife Service)

Site Location in Louisiana

N

Image Source: USGS 7.5' Topo Quadrangles, 1992 - 1993
Projection: UTM Zone 15 NAD83, Map Units in Meters

4,000 2,000 0 4,000 Feet

PARSONS	U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	**Wetlands**		
DRAWN BY: BT	SCALE: As Shown	PROJECT NUMBER: 744653.84115	
CHECKED BY: JB	DATE: June 2009	PAGE NUMBER: 5-46	
SUBMITTED BY: DS	FILE: X:\GIS\Site_inspections_sw\Maps\kisatchie_la\Fig5_3.mxd		

CHAPTER 6
SCREENING-LEVEL RISK ASSESSMENT

6.1 MUNITIONS AND EXPLOSIVES OF CONCERN SCREENING-LEVEL RISK ASSESSMENT

6.1.1 Conceptual Site Model

The CSM for Hammond Bombing and Gunnery Range, included in Appendix J, summarizes conditions at the site that could result in human exposure to MEC. It describes the types of MEC potentially present in each MRS, past MEC and MD findings, and current and projected future land use and receptors.

6.1.2 Introduction

6.1.2.1 A qualitative risk evaluation was conducted to assess the potential explosive safety risk to the public at the Hammond Bombing and Gunnery Range. The purpose of this risk evaluation is to qualitatively communicate whether a potential risk is present at the site and the primary causes of that potential risk. The risk evaluation presented here is based on historical information presented in prior studies (*e.g.*, INPR, ASR, and ASR Supplement) and observations made during the SI QR.

6.1.2.2 An explosive safety risk exists if a person can come near or into contact with a MEC item and interact with it in a manner that results in a detonation. The potential for an explosive safety risk depends on the presence of three critical elements:

- a source (*i.e.*, presence of MEC), AND
- a human receptor (*i.e.*, a person), AND
- the potential for interaction between the source and receptor (*i.e.*, the possibility the item might be picked up or disturbed by the receptor).

6.1.2.3 All three of these elements must be present for there to be an explosive safety risk. There is no risk if any one element is missing. Each of these three elements provides a basis for implementing effective risk-management response actions.

6.1.3 Qualitative Risk Evaluation

6.1.3.1 The potential risk posed by MEC was characterized qualitatively by evaluating three primary risk factors for each MRS at a site. These factors are related to the three critical elements listed above and are:

1) MEC Presence: whether there is the potential for MEC to be present at the MRS;

2) MEC Type: the type(s) of MEC that might be present at the MRS and the related potential explosive hazards; and

3) Site Accessibility: the potential receptors at the MRS and how they might interact with the MEC.

6.1.3.2 The known or suspected presence of an explosive hazard and any potential human receptors at an MRS will typically be considered sufficient justification for RI/FS. The following paragraphs describe each of the primary risk factors.

6.1.3.3 **MEC Presence**: this factor describes whether MEC either has been confirmed or is suspected to be present at the MRS, either at the surface or in the subsurface, and is based on historical information presented in prior studies (*e.g.*, INPR, ASR, and ASR Supplement) and observations made during the SI QR. Note that if there is historical evidence of potential MEC presence at a site, lack of confirmation of MEC presence during the SI QR will not be considered as evidence of MEC absence for this qualitative risk evaluation. Table 6.1 lists the three possible categories used to describe MEC Presence for this evaluation.

Table 6.1
Categories of MEC Presence

MEC Presence	Description
Confirmed or suspected	There is physical or confirmed historical evidence of MEC presence at the MRS, or there is physical or historical evidence indicating that MEC may be present at the MRS.
Small arms only(1)	The presence of small arms ammunition is confirmed or suspected, and there is evidence that no other types of munitions were used or are present at the MRS.
Evidence of no munitions	Following investigation of the MRS, there is physical or historical evidence that there are no UXO or Discarded Military Munitions (DMM) present.

(1) Small arms ammunition is defined as "ammunition, without projectiles that contain explosives (other than tracers), that is .50 caliber or smaller or for shotguns" (Department of the Army 2005).

6.1.3.4 **MEC Type**: this factor describes whether the MEC potentially present at the MRS might be detonated, resulting in injury to one or more human receptors. If multiple MEC items are potentially present at an MRS, the item that poses the greatest risk to public health is selected for purposes of this qualitative risk evaluation. This determination is based on historical information presented in prior studies (*e.g.*, INPR, ASR, and ASR Supplement) and observations made during the SI QR. Table 6.2 lists the three possible categories used to describe MEC Type for this evaluation.

Table 6.2
Categories of MEC Type

MEC Type	Description
Potentially Hazardous	Fuzed or unfuzed MEC that may result in physical injury to an individual if detonated by an individual's activities.
Small arms only(1)	Small arms ammunition is confirmed or suspected, and there is evidence that no other types of munitions were used or are present at the MRS.
Inert	Munitions debris or other items that will cause no injury (*e.g.*, training ordnance containing no explosives, fuzes, spotting charges, *etc.*).

(1) Small arms ammunition is defined as "ammunition, without projectiles that contain explosives (other than tracers), that is .50 caliber or smaller or for shotguns" (Department of the Army 2005).

6.1.3.5 **Site Accessibility**: this factor describes whether human receptors have any access to the MRS and, therefore, may interact with any MEC present at the surface or in the subsurface. For purposes of this qualitative risk evaluation, if MEC is confirmed or suspected to be present at the MRS, it is assumed that human receptors might come into contact with that MEC unless there is "Complete Restriction to Access." A description of the potential receptors will also be given with this assessment. Table 6.3 lists the two possible categories used to describe Site Accessibility for this evaluation.

Table 6.3
Categories of Site Accessibility

Site Accessibility	Description
Accessible	Access control is not complete: residents, site workers, visitors, or trespassers can gain access to all or part of the MRS.
Complete restriction to access	Human receptors are completely prevented from gaining access to the MRS.

6.1.3.6 With regard to this qualitative risk evaluation, further evaluation (*i.e.*, RI/FS) for the MRS will typically be justified if the following conditions are true:

- MEC is confirmed or suspected to be present, AND
- The MEC confirmed or suspected to be present is potentially hazardous, AND
- The MRS is accessible.

6.1.3.7 The primary risk factors identified above were evaluated for the MRSs at Hammond Bombing and Gunnery Range using the data collected during the SI field investigation and the historical data available from other studies. The following sections

discuss the qualitative risk evaluation by each primary risk factor to determine whether or not further evaluation is justified at each MRS.

6.1.4 Munitions and Explosives of Concern Risk Assessment - Bomb Target #1

6.1.4.1 No MEC or MD were observed at the Bomb Target #1 MRS during the SI field activities in August 2008. However, small pieces of WWII era HE bomb fragments were recorded as being observed during the ASR site visit in 2002 (USACE 2003). Based on this information and the known historical use of the site, the presence of MEC at the Bomb Target #1 MRS is assessed to be "confirmed or suspected."

6.1.4.2 Based on the ASR (USACE 2003) and the ASR Supplement (USACE 2004b), the munitions reportedly used at the Bomb Target #1 MRS were AN-M30 and MK 1 100-lb. general purpose bombs. Both of these munitions contain fuzes and explosives that might present a residual hazard if they remain at the site intact. Based on this information, the MEC Type at the Bomb Target #1 MRS is assessed to be "potentially hazardous."

6.1.4.3 The land comprising the Bomb Target #1 MRS is mainly residential and business property. Portions of the MRS land is managed for lumber production and used by several hunting clubs. Future land use at this site is expected to remain the same. There are no significant access restrictions present at the site. Based on this land use and the existing access restrictions, it is possible that residents, commercial/industrial workers, recreational users, or site visitors might walk across the MRS. Based on this information, the Site Accessibility at the Bomb Target #1 MRS is considered to be "accessible."

6.1.5 Munitions and Explosives of Concern Risk Assessment – Multiple Use Target

6.1.5.1 No MEC or MD were observed at the Multiple Use Target MRS during the SI field activities in August 2008. However, numerous pieces of rusted M38 practice bombs, portions of M1A1 spotting charges, and expended 0.50-caliber projectiles were recorded as being observed during the ASR site visit in 2002 (USACE 2003). Based on this information and the known historical use of the site, the presence of MEC at the Multiple Use Target MRS is assessed to be "confirmed or suspected."

6.1.5.2 Based on the ASR (USACE 2003) and the ASR Supplement (USACE 2004b), the munitions reportedly used at the Multiple Use Target MRS were M38A2 and M85 100-lb. practice bombs with M1A1 spotting charges, 2.25-inch M5 practice rockets, and small arms ammunition of 0.50-caliber and less. The practice bombs used at this MRS contain spotting charges that might present a residual hazard if they remain at the site intact. Based on this information, the MEC Type at the Multiple Use Target MRS is assessed to be "potentially hazardous."

6.1.5.3 The majority of the land comprising the Multiple Use Target MRS is managed for lumber production and is also used by several hunting clubs. Other portions of the MRS are used for private residences and small business properties. Future land use at this site is expected to remain the same. There are no significant access restrictions present at the site.

Based on this land use and the existing access restrictions, it is possible that residents, commercial/industrial workers, recreational users, or site visitors might walk across the MRS. Based on this information, the Site Accessibility at the Multiple Use Target MRS is considered to be "accessible."

6.1.6 Munitions and Explosives of Concern Risk Assessment – Bomb Target #2

6.1.6.1 No MEC or MD were observed at the Bomb Target #2 MRS during the SI field activities in August 2008. However, MD from sand-filled practice bombs and expended M1A1 spotting charges were recorded as being observed during the ASR site visit in 2002 (USACE 2003). Based on this information and the known historical use of the site, the presence of MEC at the Bomb Target #2 MRS is assessed to be "confirmed or suspected."

6.1.6.2 Based on the ASR (USACE 2003) and the ASR Supplement (USACE 2004b), the munitions reportedly used at the Bomb Target #2 MRS were M38A2 100-lb. practice bombs; AN-MK43 4.5-lb. practice bombs; AN-MK4, AN-MK5, and AN-MK23 3-lb. practice bombs; and M1A1 spotting charges. The spotting charges might present a residual hazard if they remain at the site intact. Based on this information, the MEC Type at the Bomb Target #2 MRS is assessed to be "potentially hazardous."

6.1.6.3 The land comprising the Bomb Target #2 MRS is managed for lumber production and hunting clubs. Future land use at this site is expected to remain the same. There are no significant access restrictions present at the site. Based on this land use and the existing access restrictions, it is possible that commercial/industrial workers, recreational users, or site visitors might walk across the MRS. Based on this information, the Site Accessibility at the Bomb Target #2 MRS is considered to be "accessible."

6.1.7 Munitions and Explosives of Concern Risk Assessment – Rifle Range

6.1.7.1 No MEC were observed at the Rifle Range MRS during the SI field activities in August 2008 but an expended 0.50-caliber projectile was found, which is classified as MD. Additionally, expended 0.30-caliber projectiles were recorded as being observed during the ASR site visit in 2002 (USACE 2003). Based on this information and the known historical use of the site, the presence of MEC at the Rifle Range MRS is assessed to be "small arms only."

6.1.7.2 Based on the ASR (USACE 2003) and the ASR Supplement (USACE 2004b), the munitions reportedly used at the Rifle Range MRS were limited to small arms ammunition. While unexpended small arms ammunition is considered to be MEC, it does not pose a significant explosive hazard (Department of the Army 2005). Expended small arms ammunition is classified as MD. Based on this information, the MEC Type at the Rifle Range MRS is assessed to be "small arms only."

6.1.7.3 The majority of the land comprising the Rifle Range MRS is managed for lumber production and is also used by several hunting clubs. Future land use at this site is expected to remain the same. There are no significant access restrictions present at the site. Based on this land use and the existing access restrictions, it is possible that

commercial/industrial workers, recreational users, or site visitors might walk across the MRS. Based on this information, the Site Accessibility at the Rifle Range MRS is considered to be "accessible."

6.1.8 Munitions and Explosives of Concern Risk Assessment - Gunnery Range

6.1.8.1 No MEC or MD were observed at the Gunnery Range MRS during the SI field activities in August 2008 or during the ASR site visit in 2002 (USACE 2003). However, the historical use of the MRS was as a ground gunnery range where small arms ammunition of 0.50-caliber and less was used. Based on this information, the presence of MEC at the Gunnery Range MRS is assessed to be "small arms only."

6.1.8.2 Based on the ASR (USACE 2003) and the ASR Supplement (USACE 2004b), the munitions reportedly used at the Gunnery Range MRS were limited to small arms ammunition. While unexpended small arms ammunition is considered to be MEC, it does not pose a significant explosive hazard (Department of the Army 2005). Expended small arms ammunition is classified as MD. Based on this information, the MEC Type at the Gunnery Range MRS is assessed to be "small arms only."

6.1.8.3 The land comprising the Gunnery Range MRS is managed for lumber production and is also used by several hunting clubs. Future land use at this site is expected to remain the same. There are no significant access restrictions present at the site. Based on this land use and the existing access restrictions, it is possible that commercial/industrial workers, recreational users, or site visitors might walk across the MRS. Based on this information, the Site Accessibility at the Gunnery Range MRS is considered to be "accessible."

6.1.9 Risk Summary

The qualitative MEC risk evaluation for Hammond Bombing and Gunnery Range is summarized in Table 6.4. Based on this qualitative MEC risk evaluation, there is the possibility that human receptors might come into contact with explosively hazardous MEC at Bomb Target #1, Multiple Use Target, and Bomb Target #2. Therefore, there is the potential for an explosive safety risk at these MRSs. However, no explosive hazards remain at the Rifle Range or Gunnery Range and, therefore, no explosive safety risk is considered to be present at these MRSs.

Table 6.4
MEC Risk Evaluation
Hammond Bombing and Gunnery Range

MRS	MEC Presence	MEC Type		Site Accessibility	Further Evaluation?
Bomb Target #1	Confirmed or suspected	Bomb, 100-lb., general purpose, AN-M30 Bomb, 100-lb., general purpose, MK 1	Potentially hazardous	Accessible	YES
Multiple Use Target	Confirmed or suspected	Bomb, 100-lb., practice, M38A2 Bomb, 100-lb., practice, M85 Rocket, 2.25-inch, practice, M5 Signal, spotting charge, M1A1 Small arms ammunition, .50 cal. Small arms ammunition, general	Potentially hazardous	Accessible	YES
Bomb Target #2	Confirmed or suspected	Bomb, 100-lb., practice, M38A2 Bomb, 3-lb., practice, AN-MK4 Bomb, 3-lb., practice, AN-MK5 Bomb, 3-lb., practice, AN-MK23 Bomb, 4.5-lb., practice, AN-MK43 Signal, spotting charge, M1A1	Potentially hazardous	Accessible	YES
Rifle Range	Small arms only	Small arms ammunition, .50 cal. Small arms ammunition, general	Small arms only	Accessible	NO
Gunnery Range	Small arms only	Small arms ammunition, general	Small arms only	Accessible	NO

6.2 MUNITIONS CONSTITUENT HUMAN HEALTH SCREENING LEVEL RISK ASSESSMENT

6.2.1 As described in Subchapter 5.2.8, the SLRA evaluates only observed releases of MC detected at the site. No explosives or perchlorate were detected in groundwater samples from the site. No metals exceeded background in groundwater or surface soil samples from the site with the exception of chromium in the Multiple Use Target MRS. Although the maximum concentration of chromium exceeded the selected background concentration for this MRS, chromium is not considered a potential MC (Table 4.1) and therefore was not retained for consideration in this SLRA. No explosives were detected in surface soil samples collected from MRSs. Therefore, there is no observed release of contamination at the Hammond Bombing and Gunnery Range MRSs. Therefore, based on the analytical results presented in this report, an unacceptable human health risk as a result of exposure to MC is not anticipated at the Hammond Bombing and Gunnery Range MRSs.

6.2.2 One explosive MC, nitroglycerin, was detected in surface soil at the area of potential cratering AOI, indicating a potential MC release at the site.

6.3 MUNITIONS CONSTITUENT ECOLOGICAL SCREENING LEVEL RISK ASSESSMENT

As described in Subchapter 5.2.5, Hammond Bombing and Gunnery Range is considered an important ecological place based on the probable presence of wetlands and the site inclusion in a CZMA. Explosives and perchlorate were not detected in any of the site samples and metals did not exceed background in any site samples with the exception of chromium in the Multiple Use Target MRS. Although the maximum concentration of chromium exceeded the selected background concentration for this MRS, chromium is not considered a potential MC (Table 4.1) and therefore was not retained for consideration in this SLRA. Based on the data presented in this report it is concluded there are no observed releases of contamination at the Hammond Bombing and Gunnery Range MRSs. Therefore, based on the analytical results presented in this report, an unacceptable ecological risk as a result of exposure to MC is not anticipated at this site.

CHAPTER 7
SUMMARY AND CONCLUSIONS

7.1 SUMMARY

7.1.1 An SI was performed on the 15,215.9-acre Hammond Bombing and Gunnery Range in Tangipahoa Parish, Louisiana by evaluating site-specific conditions that could impact the potential for completed exposure pathways to human and ecological receptors at the site. The ultimate objective of the SI was to determine whether a FUDS project warrants further response action under CERCLA. Hammond Bombing and Gunnery Range operated as a practice bombing and gunnery range from August 1942 to September 1945. The reported munitions used at this site included AN-M30 100-lb. general purpose bombs, MK I 100-lb. general purpose bombs, M38A2 100-lb. practice bombs, M85 100-lb. concrete practice bombs, M5 2.25-inch practice rockets, M1A1/M3/M5 spotting charges, 0.50-caliber machine gun ammunition, AN-MK4 3-lb. practice bombs, AN-MK5 3-lb. practice bombs, AN-MK23 3-lb. practice bombs, AN-MK43 4.5-lb. practice bombs, and general small arms ammunition.

7.1.2 Currently, the site is mostly being used for lumber production and hunting clubs. Small portions of the site, along the northern, western, and southern boundaries contain residential and small business areas. Future land use at this site is expected to remain the same. There are 93 domestic/public water wells on site, according to the water well survey. There could be known threatened and endangered species present at the site, there are probable wetland areas, and the site is part of a CZMA; therefore, based on the criteria in the Army Checklist for Important Ecological Places (USACE 2006), Hammond Bombing and Gunnery Range is considered an important ecological place.

7.1.3 For Hammond Bombing and Gunnery Range, data existed at the start of the project to support RI/FS recommendations for Bombing Target #1, the Multiple Use Target, and Bomb Target #2, and NDAI recommendations for the Rifle Range and Gunnery Range. During the SI, the field team collected eight multi-incremental surface soil samples (including one triplicate) and three groundwater samples (including one triplicate). Six of the surface soil samples were biased samples located within Hammond Bombing and Gunnery Range MRSs, one was collected in an AOI, while the remaining sample, an ambient background sample, was located south of the site MRSs. One of the groundwater samples was located within a site MRS (Bomb Target #1), while the other two groundwater samples were located along the western and southern edges of the site, outside of the MRSs. As agreed during the TPP Meeting, each surface soil sample was analyzed for explosives and select metals (aluminum, antimony, chromium, copper, lead, and zinc). Groundwater samples were analyzed for explosives, perchlorate, and select metals (aluminum, antimony, chromium, copper, lead, and zinc). No explosive compounds, perchlorate, or metals values exceeding background were detected in the groundwater samples. No explosives were detected in surface soil samples, and the detected concentrations of all metals analyzed did not exceed their respective selected background concentrations with the exception of chromium. Although the maximum

concentration of chromium exceeded the selected background concentration, this metal is not considered a potential MC and therefore was not retained for consideration in the Chapter 6 SLRA. One explosive compound, nitroglycerin, was detected in a surface soil sample, but the sample was collected in an AOI, not an MRS. This detection is indicative of a potential MC release or an effect of tree stump blasting, as described in Subchapter 5.8.1.

7.1.4 The field team also conducted approximately 22.4 miles of QR (3.3 additional miles to that agreed to in the TPP meeting). The QR did not locate any MEC at any of the MRSs, but a 0.50-caliber projectile was found within an overlapping area of the Rifle Range and Gunnery Range and a 0.50-caliber projectile was found just to the south of the Multiple Use Target. Based on the designated use of the site as a bombing and gunnery range, in conjunction with historical ordnance data, it is concluded that presence of MEC onsite potentially includes HE ordnance.

7.2 CONCLUSIONS

7.2.1 An exposure pathway is not considered to be complete unless all four of the following elements are present (USEPA 1989):

- A source and mechanism for contaminant release.
- An environmental transport and/or exposure medium.
- A point of exposure at which the contaminant can interact with a receptor.
- A receptor and a likely route of exposure at the exposure point.

7.2.2 The QR did not locate any MEC at Hammond Bombing and Gunnery Range, but two MD items were observed. Historical data and the presence of MD at the site suggest there is a potential for MEC to be present at some of the MRSs. Consequently, the MEC risk assessment concluded there is a potential for an explosive safety risk at the Bomb Target #1, Multiple Use Target, and Bomb Target #2 MRSs, while there is no explosive safety risk at the Rifle Range and Gunnery Range MRSs.

7.2.3 Surface soil is the medium most likely directly affected by the practice bombing and gunnery activities. Analytical results from the multi-incremental soil samples collected at the Hammond Bombing and Gunnery Range MRSs indicate there are no MC present in the soil above the detection limits at the MRSs.

7.2.4 No explosives were detected in surface soil samples, and the detected concentrations of all metals analyzed did not exceed their respective selected background concentrations with the exception of chromium. Although the maximum concentration of chromium exceeded the selected background concentration, this metal is not considered a potential MC and therefore was not retained for consideration in the Chapter 6 SLRA. Perchlorate was not detected in groundwater samples. Without an observed release of MC contamination, exposure pathways cannot be completed, and will not be completed in the future. Based on the evidence from the SI, no MC exposure pathways are complete due to lack of contamination at the MRSs. Potential risks to human health and the environment resulting

from MC are unlikely at the Hammond Bombing and Gunnery Range MRSs. However, further evaluation of MC at the area of potential cratering AOI is warranted based on the detection of nitroglycerin in the sample collected there.

CHAPTER 8
RECOMMENDATIONS

Based on the historical data concerning ordnance usage, presence of MD and munitions-related activities, and SI results, it is recommended that MRS01, MRS02, and MRS03 proceed to RI/FS and MRS04 and MRS05 proceed to NDAI (Table 8.1). Historically, no MEC incidents have been recorded; therefore, a time-critical removal action is not recommended at this time. Based on the SI sample results, it is recommended that the area of potential cratering AOI be further investigated. It is also recommended that the location of the Multiple Use Target be evaluated during the RI/FS to see if it is placed correctly on historical maps. No further evaluation of MC at the site MRSs is recommended at this time. The supporting evidence for these recommendations is as follows:

- Historical documentation indicates that HE ordnance was used at this site, and numerous MD items and cratering were observed at the Hammond Bombing and Gunnery Range MRSs during the 2002 ASR site visit.
- The MEC risk assessment concluded that potential remains for human receptors to come into contact with surface or subsurface MEC items at MRS01, MRS02, and MRS03.
- The MEC risk assessment concluded that no explosive safety risk is present at MRS04 and MRS05.
- No explosives were detected in surface soil samples, and the detected concentrations of all metals analyzed did not exceed their respective selected background concentrations with the exception of chromium. Although the maximum concentration of chromium exceeded the selected background concentration, this metal is not considered a potential MC.
- No explosives, perchlorate, or metals exceeding background levels were detected in MRS groundwater samples collected from accessible worst-case locations during the SI.

Table 8.1
Recommendations
Hammond Bombing and Gunnery Range, Tangipahoa Parish, Louisiana

MRS	Recommendation	Rationale
MRS01: Bomb Target #1	RI/FS	• ASR site inspection team observed numerous bomb craters surrounded by pieces of HE bomb fragments during April 2002 inspection. • MEC risk assessment concluded that some potential remains for human receptors to come into contact with surface or subsurface MEC items at this MRS.
MRS02: Multiple Use Target	RI/FS	• ASR site inspection team observed multiple MD items during April 2002 site visit. Site visit team also found bomb cratering in the target area. • MEC risk assessment concluded that some potential remains for human receptors to come into contact with surface or subsurface MEC items at this MRS.
MRS03: Bomb Target #2	RI/FS	• ASR site inspection team observed numerous craters and pieces of M38A2 100-lb. practice bombs during April 2002 inspection. Site inspection team noted craters were large enough that they may have been created by high explosive (HE) bombs. • MEC risk assessment concluded that some potential remains for human receptors to come into contact with surface or subsurface MEC items at this MRS.
MRS04: Rifle Range	NDAI*	• ASR site inspection team only observed small arms MD during April 2002 inspection. Site inspection team noted no cratering or areas of stressed vegetation. • MEC risk assessment concluded no explosive safety risk is considered to be present. • Although recommended for NDAI, this area will be addressed as a portion of the adjusted boundary for the Multiple Use Target during the RI/FS.*

MRS05: Gunnery Range	NDAI*	• ASR site inspection team only observed small arms MD during April 2002 inspection. Site inspection team noted no cratering or areas of stressed vegetation. • MEC risk assessment concluded no explosive safety risk is considered to be present. • Although recommended for NDAI, this area will be addressed as a portion of the adjusted boundary for the Multiple Use Target during the RI/FS.*

CHAPTER 9
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