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Mr. John Swartwout
Division of Environmental Remediation
Remedial Bureau A
New York State Department of Environmental Conservation
625 Broadway, 11th Floor
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SUBJECT: Final Comprehensive Site Evaluation Phase II Report for Hancock Field Air National Guard Base, Syracuse, New York

The Air National Guard has completed a Comprehensive Site Evaluation Phase II for the subject base. The attached report is provided for your use.

We appreciate your involvement in the Military Munitions Response Program. The point of contact for this issue is Ms. Jody Ann Murata, NGB/A7OR, (240) 612-8120, DSN 612-8120 or email jody.murata@ang.af.mil.

Jody Ann C. Murata

JODY ANN C. MURATA, GS-13
Restoration Branch

Attachment:
Final CSE Phase II Report

Hancock Field Air National Guard Base, New York

Comprehensive Site Evaluation Phase II

Draft Final Report

Military Munitions Response Program

February 2012

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Hancock Field Air National Guard Base, New York

Comprehensive Site Evaluation Phase II

Draft Final Report

Military Munitions Response Program

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February 2012

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1.0 Introduction

1.1 Purpose

In support of the Air National Guard (ANG) Military Munitions Response Program (MMRP), a Comprehensive Site Evaluation (CSE) Phase II was performed at Hancock Field Air National Guard Base (Hancock Field ANGB) during the period September 8 to September 17, 2010. The goal of the MMRP is to make Munitions Response Areas (MRAs) safe for reuse and to protect human health and the environment in the process. The MMRP addresses issues related to Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC) associated with each MRA, as well as related hazardous substances, pollutants, and Potential Contaminants of Concern (PCOCs). The MRAs evaluated in the CSE Phase II for Hancock Field ANGB are presented in **Figure 1-1**.

1.1.1 The Military Munitions Response Program

The ANG is utilizing the CSE process developed by the United States Air Force (USAF). The USAF developed CSE concept from existing data acquisition methods and data analysis, tracking and reporting tools to serve as the initial Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Preliminary Assessment (PA) and Site Inspection (SI) for the MMRP inventory. The CSE is a holistic approach to munitions response and environmental restoration that assesses the unique challenges faced at MRAs. A MRA is defined as any area on a defense site that is known or suspected to contain MEC and/or MC (e.g., former ranges, or firing-in buttresses). Based on information gathered during the CSE Phase I and II, and depending on site-specific factors, each MRA may be designated as a single Munitions Response Site (MRS), or it may be subdivided for the purposes of evaluation and response into multiple MRSs. MRSs represent discrete locations within a MRA that are based on investigation or historical records, are known or suspected to contain MEC and/or MC, and require a munitions response. Subdividing MRAs into multiple MRSs allows for characterization that is more efficient so that munitions responses specific to local conditions can be conducted.

The MMRP addresses issues related to Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC), as well as related Potential Contaminants of Concern (PCOCs) on range areas that are no longer active. MEC distinguishes specific categories of military munitions that may pose unique explosives safety risks and includes: unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents present in high enough concentrations to pose an explosive hazard (e.g., TNT, RDX). UXO are military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installation, properties, personnel, or material and remain unexploded either by malfunction, design, or any other cause. DMM are military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of, consistent with applicable environmental laws and regulations.

MC are any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

The CSE process provides the historical, anecdotal, visual, and analytical data that serves as the basis for ANG decision making regarding follow-on munitions response actions. The CSE is conducted in two distinct phases: CSE Phase I generally consists of historical records review (HRR), visual reconnaissance, and interviews, and is analogous to the CERCLA Preliminary Assessment (PA). CSE Phase II generally consists of visual surveys and environmental sampling. CSE Phase II is analogous to the CERCLA Site Inspection (SI). The CSE Phase I and II investigations differ from the traditional CERCLA PA and SI with respect to the data requirements. To meet the goals established by the Department of Defense (DoD), the CERCLA PA and SI are primarily focused on obtaining data to input into the DoD Munitions Response Site Prioritization Protocol (MRSPP) and for the purposes of site sequencing for clean-up.

The CSE includes an expanded array of analytical, tracking and reporting tools to support decision making and, therefore, has greater data requirements. Tools utilized as part of the CSE include:

- Conceptual Site Model (CSM) – for project communication, hazard assessment, and data gap analysis.
- MRSPP – to prioritize sites for further munitions response actions based on relative risk.
- Hazard Ranking System (HRS) – data elements provided to ensure full characterization of the MRA.
- Enterprise Environmental, Safety and Occupational Health - Management Information Systems (EESOH-MIS) – for a range of program management functions, including data calls and audits.
- Remedial Action Cost Engineering Requirements (RACER), MMRP Module – for estimating the costs of future munitions response actions.
- Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) – for Implementing Environmental Quality Systems for ensuring quality in work processes, products, and services.

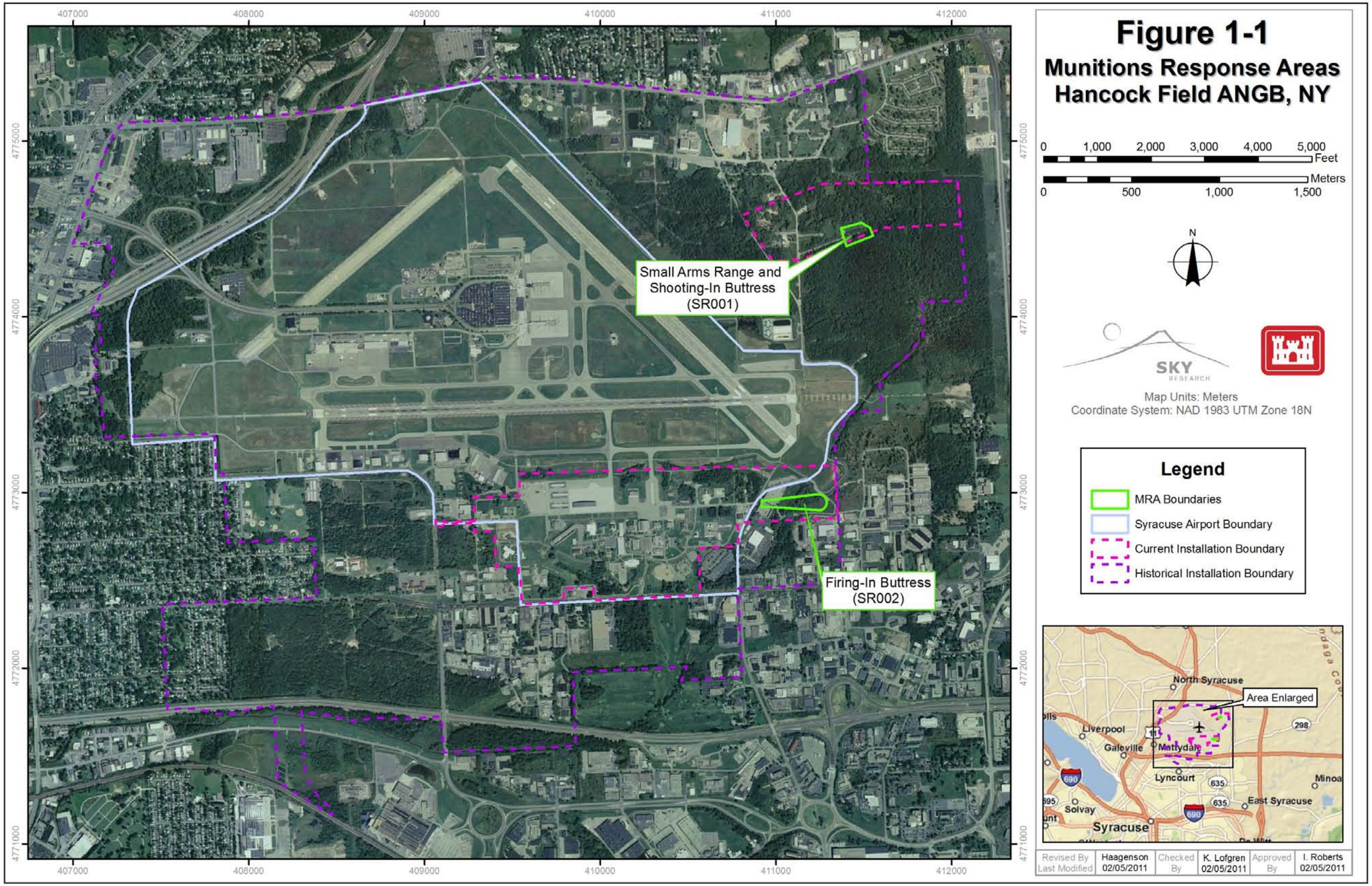
Figure 1-1
Munitions Response Areas
Hancock Field ANGB, NY
0 1,000 2,000 3,000 4,000 5,000 Feet
0 500 1,000 1,500 Meters
N
SKY RESEARCH
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Small Arms Range and Shooting-In Buttress (SR001)
Firing-In Buttress (SR002)
407000
408000
409000
410000
411000
412000
4775000
4774000
4773000
4772000
4771000
North Syracuse
Area Enlarged
Liverpool
Galeville
Mattydale
Lyncourt
Minoa
Solvay
East Syracuse
Syracuse
Revised By Last Modified
Haagenson 02/05/2011
Checked By
K. Lofgren 02/05/2011
Approved By
I. Roberts 02/05/2011

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1.1.2 Comprehensive Site Evaluation Phase II

The primary goals and performance objectives of the CSE Phase II investigations under the MMRP are to:

- Determine if further munitions response actions are required at each MRA investigated and provide a recommendation for what this action should be.
- Determine if there is a need for an emergency response and/or other removal action at any MRA on the installation.
- Determine whether releases of MC to the environment have occurred as a result of past military munitions within the MRAs.
- Determine whether MCs have affected specific receptors.
- Collect sufficient data for evaluation pursuant to the DoD's MRSPP.
- Collect sufficient data to support the development of accurate CSMs.
- Collect sufficient data to support cost estimating for further munitions response actions, using RACER.
- Collect sufficient data to support updating program management information in EESOH-MIS.

1.2 Project Data Quality Objectives

Data quality objectives (DQOs) were developed concurrently with the Work Plan to ensure; 1) the reliability of field sampling and chemical/field analyses; 2) the collection of sufficient data; 3) the quality of data generated was acceptable for its intended use; and 4) valid assumptions could be inferred from the data. DQOs are further discussed in **Section 4.6.1**. The DQOs for this investigation are based on data requirements specified in *AF Guide for Conducting the Comprehensive Site Evaluation Phase II at Air Force Munitions Response Areas* (Version 4.0) (USAF, 2006) for completion of Phase II investigations. Collected data were used to complete the following data worksheets: MRSPP (**Appendix I**), RACER (**Appendix J**), and EESOH-MIS (**Appendix K**).

1.3 Project Management

This CSE Phase II report has been prepared by Sky Research, Inc. (SKY). A list of key personnel is provided in **Table 1-1**.

Table 1-1 Key Project Personnel

Organization	Name and Project Role	Telephone Number/Email Address
ANG Operations Division, Restoration Branch (NGB/A7OR)	Mark Dickerson NGB/A7OR MMRP POC	(301) 836-8445 Mark.Dickerson@ang.af.mil
NGB/A7OR	Jody Murata Environmental Restoration Program Manager	(301) 836-8120 Jody.Murata@ang.af.mil
Hancock Field ANGB	Lt. Brent Lynch Installation Environmental Manager (EM)	(315) 233-2111 Brent.Lynch@ang.af.mil
USACE Omaha	Adam Little Project Manager	(402) 995-2730 Adam.R.Little@usace.army.mil
USACE Omaha	Brooke Conway Project Manager	(410) 962-6805 Brooke.E.Conway@usace.army.mil
USACE Omaha	Jeff Barker OE Safety Specialist	(402) 682-1564 Carl.J.Barker@usace.army.mil
Sky Research, Inc.	Ian Roberts Project Manager	(541) 552-5175 Ian.Roberts@skyresearch.com
Sky Research, Inc.	Peter Dalrymple Field Manager	(541) 556-3551 Peter.dalrymple@skyresearch.com

1.4 Project Scope

The CSE Phase II project objectives were achieved through the following specific tasks:

- Preparation and submittal of a CSE Phase II Work Plan and Site-Specific Health and Safety Plan (SSHP).
- Visual surveying to identify MEC or MEC-related items and/or features.
- Sampling and analysis of surface and subsurface soil to determine if MC, hazardous substances, pollutants and contaminants, or other constituents have been released into the environment.
- Evaluating analytical data from the sampling effort to determine whether released MC or other possible contaminants present significant potential risk to specific MRA receptors.
- Collecting sufficient data to determine migration potential for MEC and/or MC, and evaluation of potential pathway characteristics for each MRA.

- Supporting public participation activities, including the preparation of two fact sheets; one introducing the CSE Phase II and the second presenting the results of the investigation.
- Collecting information to support updating tables for the Explosive Hazard Evaluation (EHE), Chemical Warfare Materiel Evaluation (CHE), and Health Hazard Evaluation (HHE) modules of the MRSPP for MRAs.
- Updating the RACER and EESOH-MIS data to include CSE Phase II information.
- Entering the updated MRSPP, RACER, and EESOH-MIS data into the Data Management Tool (DMT) database.
- Preparation and submittal of this CSE Phase II Report in accordance with the outline provided by the USAF, *AF Guide for Conducting the Comprehensive Site Evaluation Phase II at Air Force Munitions Response Areas* (Version 4.0) (USAF, 2006).
- Updating the Administrative Record (AR) and Information Repository (IR).

CSE Phase II data requirements for each MRA are listed below in **Table 1-2**.

Table 1-2 Data Requirements for Hancock Field ANGB CSE Phase II Activities

MRA (Range Type)	Scope	Proposed CSE Phase II Activities	Potential Results and Proposed Path Forward
Small Arms Range and Shooting-In Buttress (SR001)	Evaluate if lead is present in soils above applicable regulatory action levels. Evaluate whether evidence of MEC is present at the target areas and evaluate whether MC and lead are present above applicable regulatory action levels.	Perform a visual survey of the MRA to evaluate the location, features of the site and evidence of munitions usage. Conduct XRF sampling and off-site laboratory correlation sampling of surface soil and potential sub surface soil to evaluate if lead is present above the 400 mg/kg U.S. Environmental Protection Agency (USEPA) Region 4 Regional Screening Level) regulatory action level.(USEPA, 2001). Define vertical and horizontal extent of contamination if elevated levels of lead are detected. If MEC or evidence of MEC use is identified during the visual survey, collect surface soil samples for off-site laboratory analysis to evaluate if MC listed in **Table 4-1** are present in soil above regulatory action levels.	If lead is present above regulatory action level, recommend appropriate response actions. If MEC evidence is observed and if MC or lead are above regulatory action levels, evaluate future munitions response action. If no MEC evidence, no MC sampling, and propose No Further Action (NFA). If no MC or lead are present above regulatory action levels, propose NFA.

MRA (Range Type)	Scope	Proposed CSE Phase II Activities	Potential Results and Proposed Path Forward
Firing-In-Buttress (SR002)	Evaluate if lead is present in soils above applicable regulatory action levels. Evaluate whether evidence of MEC is present at the target areas and evaluate whether MC and lead are present above applicable regulatory action levels.	Perform a visual survey of the MRA to evaluate the location, features of the site and evidence of munitions usage. Conduct XRF sampling and off-site laboratory correlation sampling of surface soil and potential sub surface soil to evaluate if lead is present above the 400 mg/kg (USEPA Region 4 Regional Screening Level) regulatory action level (USEPA, 2001). Define vertical and horizontal extent of contamination if elevated levels of lead are detected. If MEC or evidence of munitions use is identified during the visual survey, collect surface soil samples for off-site laboratory analysis to evaluate if MC listed in **Table 4-1** are present in soil above regulatory action levels.	If lead is present above regulatory action level, recommend appropriate response actions. If MEC evidence is observed and if MC or lead are above regulatory action levels, evaluate future munitions response action. If no MEC evidence, no MC sampling, and propose NFA. If no MC or lead are present above regulatory action levels, propose NFA.

1.5 Report Organization

This report is organized into the following 13 sections:

Section 1 – Introduction: Introduces the project and presents the objectives, management, and organization of the report.

Section 2 – Installation Background: Describes the location and operational history of Hancock Field ANGB and the associated MRAs.

Section 3 – Physical and Environmental Setting: Describes the climate, topography, hydrology, soil and vegetation, geology, and hydrogeology for Hancock Field ANGB.

Section 4 – Investigation Methods and Approach: Summarizes the field activities completed during the CSE Phase II, including approach and methodologies used during the CSE Phase II field activities.

Section 5 – Field Investigation Results: Describes the MRAs, the history of MEC activities, the current land uses(s), access controls and restrictions, field sampling procedures results, and identifies potential receptors.

Section 6 – Evaluation of Known/Suspected Munitions and Explosives of Concern: Describes the technical data for potential MEC at the MRAs, the primary sources and release mechanisms associated with the MEC, the MEC locations and secondary sources, the MEC penetration estimates, any special considerations associated with the MEC, any known MC, and any explosive safety submission information.

Section 7 – Evaluation of Hazardous Waste/Substances: Describes the hazardous waste activities and characteristics, the source areas, the PCOC as well as any known or suspected releases, and any special considerations associated with the MRAs.

Section 8 – Conceptual Site Models: Presents the CSMs for MEC and MC at the MRAs and evaluates the media transport mechanisms associated with any potential MEC and/or MC present.

Section 9 – Screening Level Human Health Risk Assessment: Discusses the results of the Screening Level Human Health Risk Assessment (HHRA) where maximum detected chemical concentrations for each medium evaluated were compared to generic screening levels established for the protection of potential human receptors.

Section 10 – Screening Level Ecological Risk Assessment: Discusses the results of the Screening Level Ecological Risk Assessment (SLERA) where maximum detected chemical concentrations for each medium evaluated were compared to generic screening levels established for the protection of potential ecological receptors.

Section 11 – Summary and Conclusions: Presents the summary and conclusions of the CSE Phase II Report.

Section 12 – Munitions Response Site Prioritization Protocol: Summarizes the results of the updates to the EHE, HHE, and CHE modules, and discusses development of the MRSPP score for each MRA.

Section 13 – Potential Future Actions: Provides recommendations regarding cohort assignment, process streamlining opportunities, future response actions and objectives, identifies any gaps in the CSM, ranks the DoD MRSPP priority, and provides any site sequencing considerations.

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2.0 Installation Background

2.1 Location and Setting

Hancock Field is located at the Syracuse Hancock International Airport in New York. It is approximately five miles north of the City of Syracuse in Onondaga County (**Figure 1-1**). The current installation consists of several buildings and operational facilities that are separated into two main tracts of land: Tract II and Tract III. Historically, Tract I was once part of Hancock Field but has since been transferred to the City of Syracuse. The City of Syracuse owns all land bordering Tract II and Tract III. The total acreage of Hancock Field is 356.9 acres—Tract II is 87.0 acres, and Tract III is 269.9 acres. The base was originally much larger but has been reduced in size over the past few decades (USACE, 2009).

2.2 Installation Operational History and Mission

Hancock Field was built in 1942, (then known as Mattydale Bomber Base) as a staging and storage area, repairing and re-outfitting B-17 and B-24 aircraft used in World War II (WWII). Three 5,500-foot (ft) runways were also built the same year. In addition, the First Concentration Command, later known as the Air Service Command, used the base to assemble and test B-24 aircraft. In 1946, the City of Syracuse took over the Mattydale Bomber Base, and in 1948, the base was dedicated as a commercial airfield. The Clarence E. Hancock Airport opened in September 1949. Hancock Airport was awarded international airport status in 1970. Over the last few decades, both the mission and physical size of the installation have been reduced from the initial World War II capacity. Much of the airbase, including the runways, was converted to civilian use as the Syracuse Hancock International Airport (USACE, 2009).

Hancock Field is home to the 174th Fighter Wing of the NY ANG. The 174th began as the 138th Fighter Squadron (FS) on October 28, 1947. In 1962, the 138th was official renamed the 147th Tactical Fighter Group (TFG). In 1979, there was a status change from TFG to Tactical Fighter Wing (TFW). In 1992, the TFW was re-designated as the 174th Fighter Wing (FW). The installation's mission is to maintain well-trained, well-equipped units available for prompt mobilization during war and provide assistance during national emergencies (such as natural disasters or civil disturbances). During peacetime, the combat-ready units and support units are assigned to most USAF major commands (MAJCOMs) to carry out missions compatible with training, mobilization readiness, and humanitarian and contingency operations. Mission-related activities include vehicle, aircraft, and runway maintenance, fueling operations, and military training operations. Aircraft utilized by the unit include P-47D Thunderbolts, F-84B Thunderjets, F-86H Sabrejets, Fairchild A-10A Thunderbolt II, and the F-16A Fighting Falcon (http://dmna.state.ny.us/ang/174/174.php?id=history).

2.3 Summary of Munitions and Explosives of Concern Related Activities

The types of activities likely to have been conducted at sites eligible for the MMRP at Hancock Field ANGB include small arms activities at the two MRAs. Potential ordnance includes expended small arms and 40mm practice grenades at the Small Arms Range and Shooting-In Buttress (SR001). The Firing-In Buttress (SR002) was used by bombing aircraft to sight onboard guns. Potential ordnance at the site would have included expended small arms (USACE, 2009). During the Phase I a 3.5inch HEAT rocket was observed embedded in the remaining structure.

2.4 Identification of Munitions Response Areas

The CSE Phase I investigated ten MRAs. The CES Phase I investigation determined eight of the MRAs had no evidence of historical munitions usage or indication of potential sources for MC contamination and did not require further investigation. Two MRAs were carried into the CSE Phase II (**Table 2-1**); Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002) which is a total of approximately 9.5 acres. Figures of individual MRAs are presented in **Figure 2-1** and **Figure 2-2**.

Table 2-1 MRA Summary Information

EESOH-MIS Status/MRA ID	Name	MEC Types and Activities	Acreage	Approximate Dates of Operation	Current Activity Level
SR001	Small Arms Range and Shooting-In Buttress	Small arms, M-203 training with 40mm practice grenades and small arms ammunition	3.7	1940's - 2002	Non-operational
SR002	Firing-In Buttress	Small arms, 3.5-inch rocket, HEAT, M28A2	5.8	Unknown	Non-operational

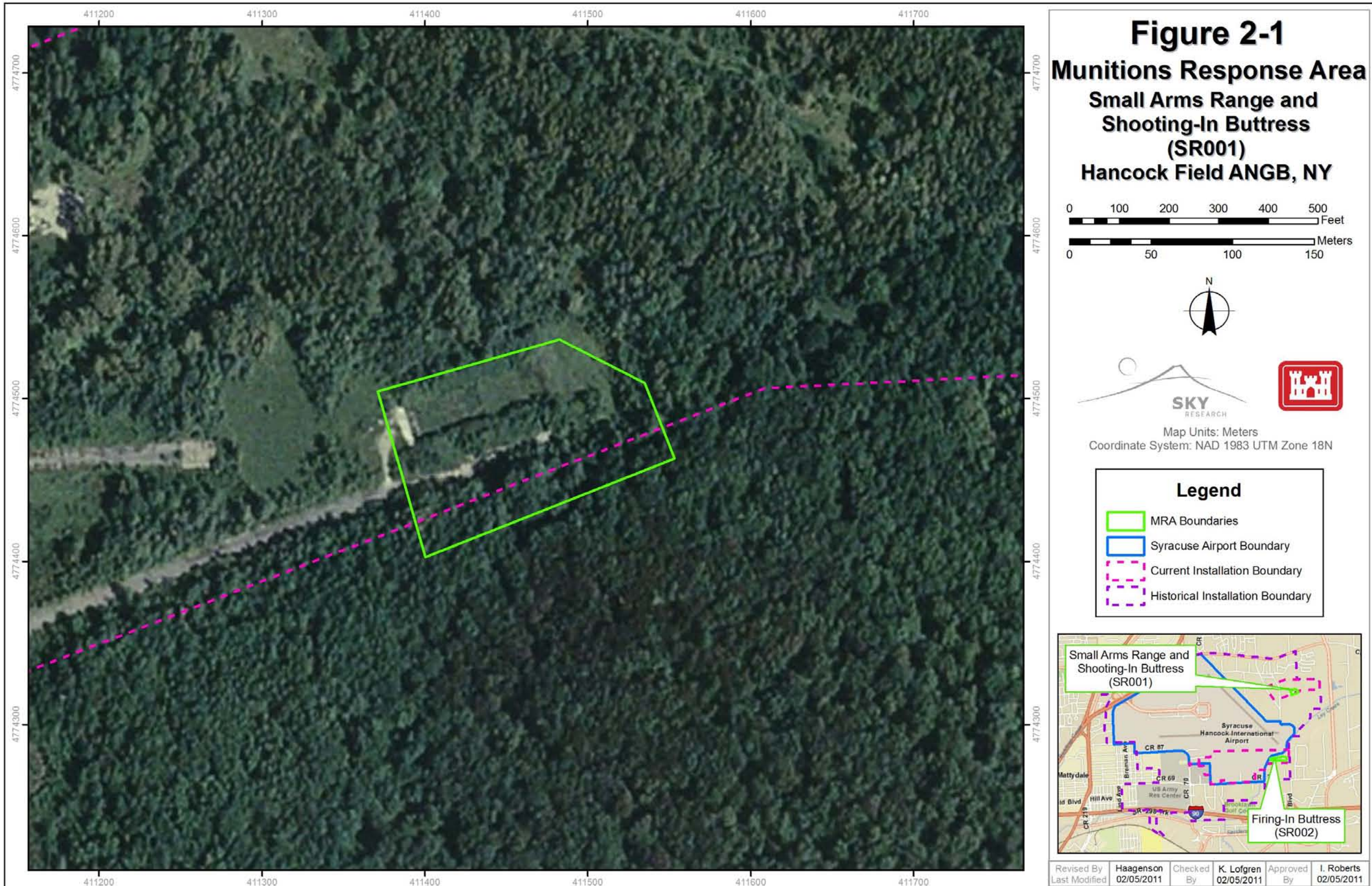
Figure 2-1
Munitions Response Area
Small Arms Range and Shooting-In Buttress (SR001)
Hancock Field ANGB, NY
0 100 200 300 400 500 Feet
0 50 100 150 Meters
N
SKY RESEARCH
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Small Arms Range and Shooting-In Buttress (SR001)
Syracuse Hancock International Airport
Firing-In Buttress (SR002)
Revised By Last Modified
Haagenson 02/05/2011
Checked By
K. Lofgren 02/05/2011
Approved By
I. Roberts 02/05/2011
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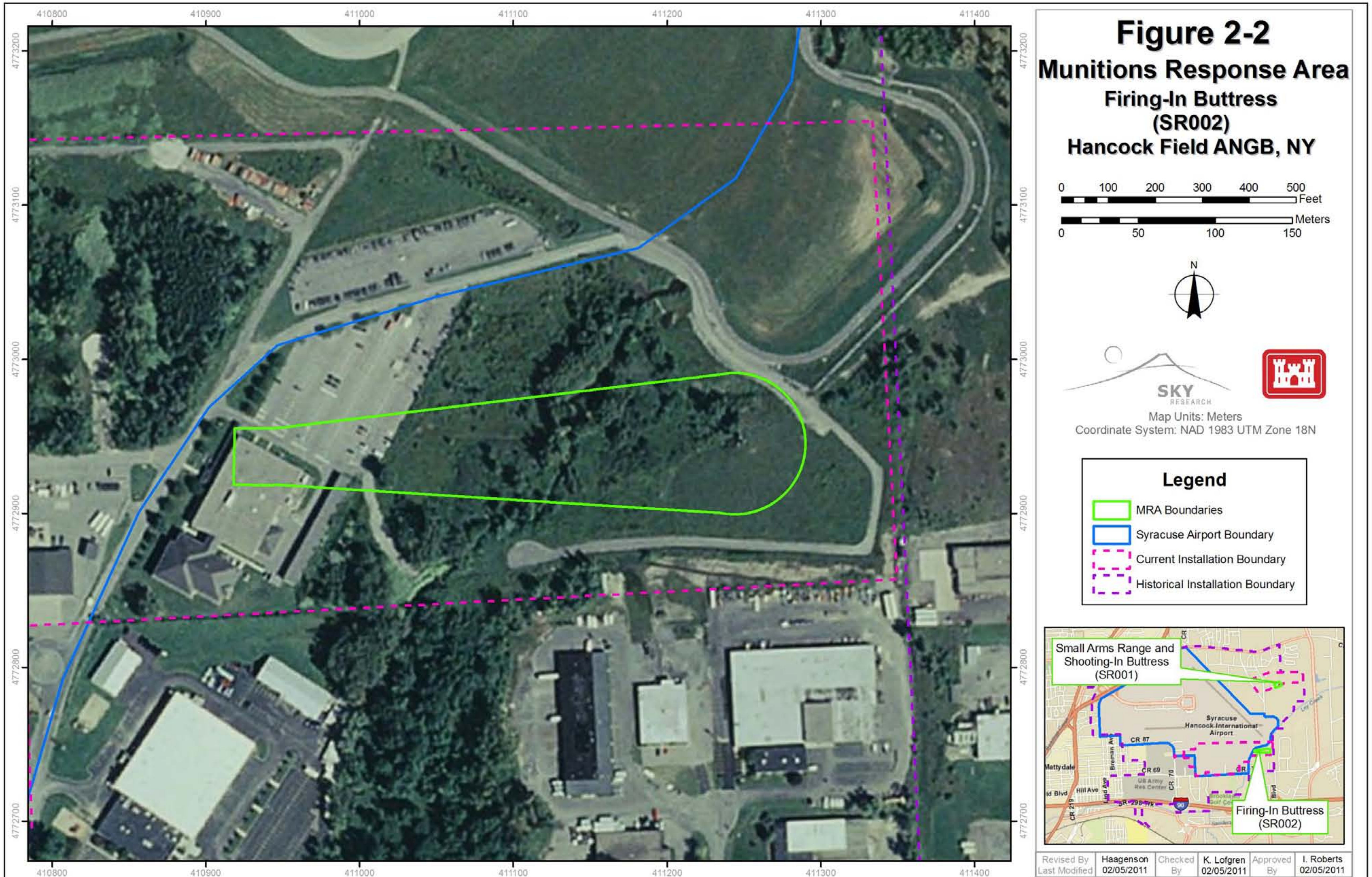
Figure 2-2
Munitions Response Area
Firing-In Buttress
(SR002)
Hancock Field ANGB, NY
0 100 200 300 400 500 Feet
0 50 100 150 Meters
N
SKY RESEARCH
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Small Arms Range and Shooting-In Buttress (SR001)
Syracuse Hancock International Airport
Firing-In Buttress (SR002)
Revised By Last Modified
Haagenson 02/05/2011
Checked By
K. Lofgren 02/05/2011
Approved By
I. Roberts 02/05/2011

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2.5 Previous Investigations

This section presents a summary of the previous investigations performed on the MRAs subject to this CSE Phase II and was based on information presented in the Hancock Field ANGB Comprehensive Site Evaluation Phase I (USACE, 2009). Additional investigations on Hancock Field ANGB include the Operational Range Assessment Plan (ORAP) Phase I Qualitative Assessment reports for the Tract II Small Arms Range and Tract III Small Arms Range.

2.5.1 Comprehensive Site Evaluation Phase I

In support of the MMRP at Hancock Field ANGB, a CSE Phase I was performed in 2009. The objectives of the CSE Phase I was to identify all potential MRAs on the installation, investigate these MRAs, and determine if additional munitions response actions were required or provide sufficient documentation to support NFA (USACE, 2009).

The CSE Phase I activities compiled and evaluated information on Hancock Field ANGB relating to past related military munitions activities, physical site conditions, and future land uses and activities. Information sources included national, regional, and local archival records, interviews with Hancock Field ANGB personnel, and observations made during the field reconnaissance (USACE, 2009).

This information was reviewed and used to develop and refine an Interim Conceptual Site Model (ICSM) of potential exposures to MEC and MC. This ICSM related the identified sources of explosive items to potential direct contact exposures to people at Hancock Field ANGB in consideration of both the current and projected future land uses. These relationships, or potentially complete exposure pathways, also considered the possible transport or migration of potentially explosive MEC items from place to place as the result of natural processes or human activities. These land use scenarios were evaluated with respect to the interaction of people with the land at Hancock Field ANGB. The compiled information was then used to conduct an assessment of the potential explosive and human health hazards at each MRA. CSE Phase I resulted in the collection and evaluation of a large amount of information regarding past military munitions-related activities at Hancock Field ANGB, current conditions on-site with respect to the presence of MEC, physical setting of the land, and future use plans for the property (USACE, 2009).

The results of this investigation concluded that potential MEC and MC are or could be present on 9.5 MMRP-eligible acres (USACE, 2009).

The CSE Phase I identified two MRAs as listed below and presented in **Figure 2-1** and **Figure 2-2** (USACE, 2009).

- Small Arms Range and Shooting-In Buttress (SR001).
- Firing-In Buttress (SR002).

2.5.2 CSE Phase I Results

The Small Arms Range and Shooting-In Buttress (SR001) was used for small arms training. In addition, M-203 training with 40mm practice grenades was reported. Potential munitions at the site would have included expended small arms and practice 40mm grenades.

The Firing-In Buttress (SR002) was used as a backstop for test firing of up to .50 cal. ammunition from F-86 aircraft. One large-caliber round, identified as a 3.5-inch rocket, HEAT, M28A2, was embedded in the top portion of railroad ties which forms the top of the firing-in buttress catch box.

The potential for MEC was anticipated based on the Phase I findings at the two MRAs investigated in this CSE Phase II.

3.0 Physical and Environmental Setting

3.1 Climate

The climate at Hancock Field ANGB is mild during summer and very cold during winter with abundant precipitation. Monthly mean high temperatures, range from 31 degrees Fahrenheit (°F) in January, to 82 (°F) in July. Monthly mean low temperatures, range from 15 (°F) in January, to 60 (°F) in July. Average annual precipitation is approximately 38.3 inches. Annual mean snowfall is approximately 107.1 inches (USACE, 2009).

3.2 Topography

Hancock Field is located within the Ontario-Mohawk Lowland Region of the Central Lowland Physiographic Province, which extends to Buffalo, New York. This province has a relatively flat topography caused by glacial erosion and deposition during the Wisconsin Glaciation. The installation is part of a low-lying area of flat lowlands situated between Lake Ontario and the Onondaga Escarpment in Syracuse, New York. Topography across the installation slopes gradually up from 385 ft above mean sea level (msl) in the southeast to approximately 425 ft above msl at the west-northwest part of the installation (USACE, 2009).

3.3 Hydrology

Hancock Field and surrounding areas contain naturally-occurring swamps and poorly-drained areas. These natural lowlands and swamps have drastically been altered because of construction activities. The surface drainage in the area of the site is to the south and southeast toward Ley Creek. There are wetlands located in the southern and eastern portion of the installation; however, no wetlands occur at any of the MRAs (USACE, 2009).

3.4 Soil and Vegetation Characteristics

3.4.1 Soil Characteristics

Soils at Hancock Field ANGB are generally composed of silts with varying amounts of clay and fine to medium sand. The Tract II area specifically contains Alton gravelly fine sandy loam, Croghan loamy fine sand, Galen very fine sandy loam, Minoa fine sandy loam, Niagara silt loam, cut and fill land, made land, gravel pits, Carlisle muck, and Palms muck. Tract III contains Arkport very fine sandy loam, Collamer silt loam, Colonie loamy fine sand, Croghan loamy fine sand, Galen very fine sandy loam, Lockport and Brockport silty clay loams, Minoa fine sandy loam, Naumburg loamy fine sand, Niagara silt loam, Ontario loam, and urban land **(Figure 3-1)** (USACE, 2009).

3.4.2 Vegetation Characteristics

Most natural vegetation is no longer present at Hancock Field because of past construction activities and the changed elevation of the area. The vegetation consists of manicured lawns, landscaped areas, fields, and wooded areas. Six plant species (Weak Stellate Sedge, Large Twayblade, Southern Twayblade, Pod Grass, Calypso, and Marsh Valerian) within four miles of Syracuse are listed by the state as rare, vulnerable, or threatened, according to the New York State Department of Environmental Conservation Wildlife Resources Center. It is unknown if any of the species are present at Hancock Field (USACE, 2009).

3.5 Geology and Hydrogeology

Hancock Field is located in an area of flat lowlands between Lake Ontario and the Onondaga Escarpment. Multiple layers underlie the base, including unconsolidated lake sediments from 0 to 50 ft below ground surface (bgs), glacial till from 50 to 80-100 ft bgs, and sedimentary bedrock beneath the till. The lake sediments are composed of silts with varying amounts of clay and fine to medium sand. The glacial till is composed of gravel and large cobbles in silty clay. The sedimentary bedrock consists of shales and siltstones of the Vernon Formation (USACE, 2009).

The lake sediments contain an unconfined, non-sole source water table aquifer, which occurs several feet bgs. Due to low transmissivity, the aquifer is not a suitable source of potable water. A confined aquifer is found in the bedrock below the glacial till. The glacial till layer serves as a barrier to vertical groundwater migration between the overlying lake sediments and underlying sedimentary bedrock. There is a strong upward flow potential between the confined bedrock aquifer and the unconfined water table aquifer. Potential for contamination is unknown (USACE, 2009).

Groundwater is generally encountered within the silty clay at depths of 5 to 11 feet bgs during the spring season and at depths of 9 to 15 feet bgs during the fall season (DoD, 2010).

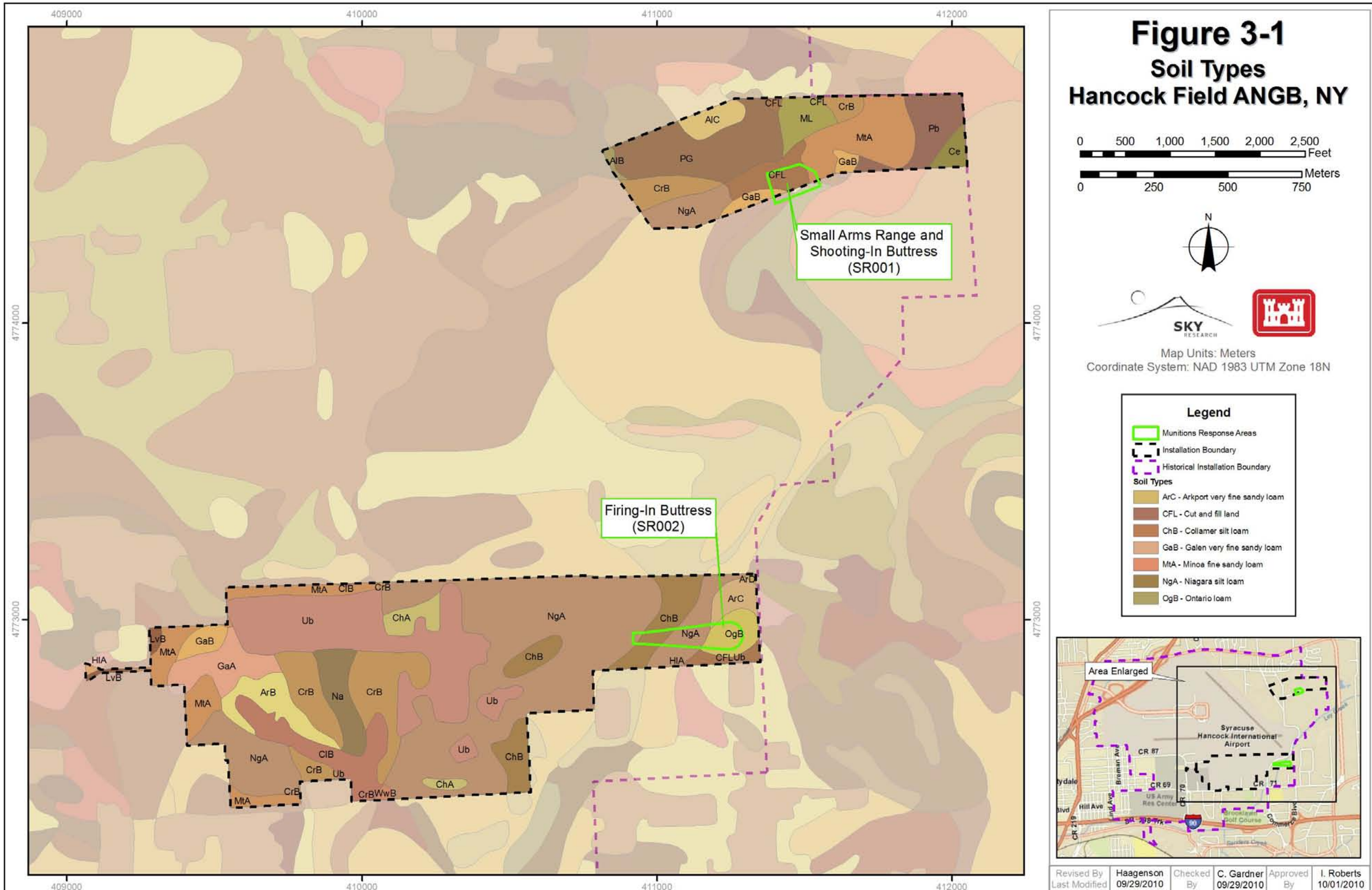
Figure 3-1
Soil Types
Hancock Field ANGB, NY
0 500 1,000 1,500 2,000 2,500 Feet
0 250 500 750 Meters
N
SKY RESEARCH
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
Munitions Response Areas
Installation Boundary
Historical Installation Boundary
Soil Types
ArC - Arkport very fine sandy loam
CFL - Cut and fill land
ChB - Collamer silt loam
GaB - Galen very fine sandy loam
MtA - Minoa fine sandy loam
NgA - Niagara silt loam
OgB - Ontario loam
Small Arms Range and Shooting-In Buttress (SR001)
Firing-In Buttress (SR002)
Area Enlarged
Syracuse Hancock International Airport
409000
410000
411000
412000
4774000
4773000
Revised By Last Modified | Haagenson 09/29/2010 | Checked By | C. Gardner 09/29/2010 | Approved By | I. Roberts 10/01/2010

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4.0 Investigation Methods and Approach

4.1 Purpose

The purpose of this section is to describe the approach and methods implemented for the Hancock Field ANGB Phase II investigation. The CSE Phase II investigation approach included visual surveys, soil sampling and analysis. Sampling and analysis included on-site XRF analysis for lead, and lead correlation sampling for off-site laboratory analysis.

4.2 Comprehensive Site Evaluation Phase II Screening Criteria

Screening criteria for the environmental media investigated for the CSE Phase II are described in this section.

4.2.1 Screening Level Assessments

4.2.1.1 Human Health Screening Level Assessments

The hierarchies for the human health screening level assessment are presented in the Final Work Plan (USACE, 2010). Human health soil screening values identified for use in this CSE Phase II evaluations include Regional Screening Levels (RSLs) published by USEPA and recommended soil cleanup objectives published by the New York Department of Environmental Conservation (NYDEC). The human health screening criteria for the CSE Phase II analytical data are presented in **Table 4-1**.

4.2.1.2 Ecological Screening Level Assessments

The methods for the ecological screening level assessment are presented in the Final Work Plan (USACE, 2010). The ecological screening values used during the CSE Phase II evaluations were obtained from:

- Ecological Soil Screening Levels (EcoSSLs) (USEPA, 2005); http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_lead.pdf).
- New York State, Department of Environmental Conservation, Table 375-6.8(b) Cleanup Objective for Protection of Ecological Resources (http://www.dec.ny.gov/regs/15507.html).

The ecological screening criteria for the CSE Phase II analytical data are presented in **Table 4-1**. The ecological screening levels are based on the lowest benchmark within these sources.

4.2.2 Background Level Assessments

A quantitative background level assessment for Hancock Field ANGB was not performed due to lack of a site-specific background data set. All sampling results were compared to USEPA RSLs and EcoSSLs. A qualitative assessment of background was conducted comparing maximum and mean lead concentrations at Hancock Field ANGB to 50th percentile and 95th percentile background concentrations for lead in the eastern United States (USEPA, 2003).

4.2.3 Screening Criteria Uncertainty Analysis

The screening criteria used to assess chemical constituent concentrations measured in soil and the screening criteria approach are associated with a degree of uncertainty. Risk-based screening criteria are by definition generic, and are based on a conservative (health protective) default set of exposure assumptions for a typical site under presumed land use conditions. Therefore, the use of a screening criteria approach will almost always over-estimate, rather than under-estimate, potential human health and ecological risk or hazard related to exposure from the pathways associated with the criteria.

In addition, the use of maximum detected sample results in the screening criteria assessment, as compared with a statistical approach (e.g., use of a 95% UCL on the mean of a dataset), is also a conservative approach that usually results in an over-estimate, rather than under-estimate, of potential human health and ecological risk or hazard.

Table 4-1 Hancock Field ANGB Soil Screening Values

	Human Health Soil Screening Values Residential (mg/kg)		Ecological Soil Screening Values (mg/kg)	
Analyte	USEPA RSL [A]	NYDEC Clean-up Objective [B]	USEPA EcoSSL [C]	NY State [F]
Lead	**400**	site background [G]	**11**	63
Inorganic SW-846 Methods 3050B/6010B/(6200 XRF)				

NOTES:
mg/kg = milligrams per kilogram A dash (–) = No benchmark available.
Bolded value is the selected human health or ecological soil screening value.
[A] USEPA Regional Screening Level. Residential soil criterion; industrial soil criterion in parentheses. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/
[B] New York Department of Environmental Conservation, Determination of Soil Clean-up Objectives and Clean-up Levels (TAGM 4046); Table 4. (www.*accreditedanalytical.com/forms/NY-Heavy-Metals.pdf).*
[C] From Ecological Soil Screening Levels (EcoSSLs) (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_lead.pdf)
[D] Los Alamos National Laboratory (LANL), New Mexico, EcoRisk Database, Release 2.5, 2010 (http://www.lanl.gov/environment/cleanup/ecorisk.shtml).
[E] From ORNL: Efroymson et al., 1997. *Preliminary Remediation Goals (PRGs) for Ecological Endpoints, ES/ER/TM-162/R2*. (http://rais.ornl.gov/documents/tm162r2.pdf).
[F] New York State, Department of Environmental Conservation, Table 375-6.8(b) Cleanup Objective for Protection of Ecological Resources (http://www.dec.ny.gov/regs/15507.html).
[G] Reference **Section 9** for discussion of site background.

4.3 Daily Quality Control Report

The field team was responsible for documenting the day's field activities in a Daily Quality Control Report (DQCR). The DCQR provided a standardized format to document the field team, hours and locations of the field work, verification of data quality procedures, weather conditions, circumstances that affected the quantity or quality of the field activities, or any other pertinent information that required formal documentation. The CSE Phase II DQCRs are available in **Appendix E**.

4.4 Visual Survey

As part of the CSE Phase II effort, visual surveys were performed at both of the MRAs, Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002). The goal of these surveys was to cover the entire MRA to the extent practical (depending on environmental and infrastructure factors that may limit the visual survey) and identify any features directly or indirectly related to MEC activity or munitions related features in the survey area. Physical conditions at the site that limited the surveys were documented using a Trimble GeoXT Global Positioning System (GPS) and/or digital photographs.

During the visual surveys, the field team members searched for visual evidence of MEC and munitions related features and categorized these features as

- Small Arms Debris - any type of projectile, casing or remnant from a 0.50 caliber or smaller ammunition.
- Clay Targets - whole or fragmented clay composite discs commonly used for trap and skeet shooting.
- Munitions Debris (MD) - remnants (fragments, tail fin sections, grenade safety levers, expended fuzes, etc.) from any munitions greater than 0.50 caliber.
- MEC - any munitions that pose an explosive threat including MC that may be present the soil or surrounding range features.
- DMM - any munitions that were abandoned or not disposed of properly; this classification does not include UXO.
- Chemical Warfare Material (CWM) - any munitions that contain a chemical compound that is intended to kill, seriously injure, or incapacitate a person through its physiological effects; the CWM classification also includes the Chemical Agent Identification Set (CAIS) kits.
- Evidence of MEC Activity - any features indicative of former range use such as targeting berms associated with munitions greater than 0.50 caliber, open detonation pits, craters and firing points.
- Evidence of Small Arms Activity - any features associated with 0.50 caliber ammunition and smaller including concrete pad firing stations, target frames and berms.
- Other - a miscellaneous category designed to allow the survey team flexibility to document relevant items that do not fit into the preceding categories.

Not all of the above features were observed during the visual survey but were included as search criteria to identify any munitions not related to known historical use. During the CSE Phase II visual surveys, small arms debris, munitions debris (practice grenades) and small amounts of clay target debris were observed at the Small Arms Shooting-In Buttress (SR001) and small arms debris and one 3.5-inch rocket spacer was observed at the Firing-In Buttress (SR002).

4.4.1 Visual Survey Technologies

The survey teams utilized three pieces of equipment: 1) Trimble GeoXT GPS unit, 2) Ricoh Model 500E digital camera, and 3) Schonstedt magnetometer. The Schonstedt magnetometer was utilized in accordance with safety procedures for anomaly avoidance.

4.4.1.1 Trimble Model GeoXT GPS

The Trimble GeoXT GPS unit is a high performance, Wide Area Augmentation System (WAAS)-enabled sub-meter GPS receiver combined with a rugged handheld computer. The computer runs Microsoft Windows Mobile Version 5.0 software powered by a 416 megahertz (MHz) processor. The GeoXT is weatherproof and is powered by an all-day, rechargeable battery.

4.4.1.2 Ricoh Model 500SE Camera

The Ricoh 500SE digital camera is an 8.1 mega-pixel camera with a detachable GPS module. As each picture was taken, the location of the camera (derived from its own GPS module or an external GPS device) was embedded in the picture file header. The Ricoh 500SE also provides a user-defined data-dictionary for tagging each picture with workflow-related information. Its lens allows for both wide-angle and close-up photographs and the geo-coded images can be converted into 'layer files' for geographic information system (GIS).

4.4.1.3 Schonstedt Model GA-52 Cx Metal Detector

The Schonstedt GA-52 Cx metal detector has been the industry standard for 35 years. It is a handheld, analog, fluxgate magnetometer equipped with five sensitivity settings. It emits an audio tone that peaks in frequency when the instrument's tip is directly over a ferrous item. Nonferrous material such as aluminum and brass are not detected. The Schonstedt was used for MEC avoidance/safety purposes during the visual survey.

4.4.2 Visual Survey Methodologies

The visual survey team for both MRAs consisted of a field lead, one field technician and one UXO technician. The UXO Technician II carried a Schonstedt magnetometer for safety, and provided expertise with regard to the identification of munitions related material at the Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002).

While in the field, the buddy system was implemented and the field lead and field technicians carried a Trimble GeoXT GPS unit and a Ricoh GPS-enabled camera. Prior to the start of each field day, the GeoXT was uploaded with transects to be surveyed. The GPS displayed planned and completed transects for the MRA, providing tracking guidance for the survey teams. The survey team traversed each MRA, and collected digital photographs and GPS coordinates of any pertinent features encountered. Each feature was classified in the GPS data dictionary based on the following attributes:

- Feature identification.
- Date/Time.
- Type (i.e., site-specific items).
- Category (i.e., generalized groupings of similar features).

- Condition (i.e., intact/debris/frag).
- Count (i.e., number of items).
- Comment.
- Survey team.

Additional visual survey features were documented at XRF sample locations during the course of XRF soil sample collection, primarily noting the presence or absence of any lead debris and clay target debris. These additional features were included in the visual survey results. At the end of each day, all data were uploaded to the project GIS database. Electronic status maps were produced and provided to the project team on a daily basis. Following the visual surveys, field notes, photographs, and GPS data were consolidated for each MRA.

4.4.3 Visual Survey Quality Control Procedures

At the beginning of each field day, the visual survey teams validated both the GeoXT GPS unit and the camera at an established control point to ensure the units were functioning properly and returning correct positional information. The GeoXT GPS unit and the camera functioned properly during the CSE Phase II fieldwork.

Prior to de-mobilization of the field teams, field data and visual survey coverage were reviewed to ensure consistency and appropriate coverage by the Quality Control Specialist.

4.5 Environmental Media Sampling and Analysis

Environmental soil sampling was performed for lead (using the XRF) at both MRAs. The purpose of XRF sampling was to determine if lead is above the USEPA RSL, and if it exceeds screening levels, to delineate the extent of lead contamination horizontally and vertically. The XRF soil sampling is discussed in detail in **Section 4.6.1**.

Selected XRF soil samples from both the sites were split for off-site laboratory analysis of lead to correlate XRF sample results to determine if the XRF data could be deemed as definitive data per the requirements of the method (**Section 5.4**).

No MC sampling for explosives was conducted because no significant evidence of MEC use was identified during the visual survey at the Small Arms Range and Shooting-In Buttress (SR001) or Firing-In Buttress (SR002). The 40 mm practice grenades found at the Small Arms Range and Shooting-In Buttress (SR001) have no explosive hazard. The spacer found at the Firing-In Buttress (SR002) did not constitute a significant enough source to warrant sampling.

Sample locations were recorded in the field using a Trimble GeoXT hand-held GPS unit.

Sampling at each MRA was performed in accordance with the method and approach described in the Hancock Field ANGB CSE Phase II Work Plan and SKY SOP-100 (USACE, 2010).

4.5.1 X-Ray Fluorescence Sampling

Soil sampling and on-site XRF analysis was performed at both MRAs. XRF is utilized because lead is the primary constituent of small arms. The intent of the sampling and on-site XRF analysis is to determine whether lead concentrations are greater than the USEPA RSL and evaluate the nature and extent of lead contamination. The sampling and analysis approach described herein is in accordance with the SKY SOP-100 and uses USEPA SW-846 Method 6200 as general guidance.

4.5.1.1 X-Ray Fluorescence Technology

Niton XL3t XRF Analyzer: The Niton XL3t is a hand held field portable tube based XRF analyzer. The XL3t is an energy dispersive open beam instrument that has a maximum output of 40 kip. The analyzer was mounted into an optional test stand that reduces analyst fatigue and allows for maximum sample throughput.

XRF is a method that uses x-ray tubes to irradiate soil samples with x-rays. When an atom absorbs the source x-rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of x-rays characteristic of the given atom. The emission of x-rays, in this manner, is termed x-ray fluorescence. By calibrating the instrument with standards of known concentrations and demonstrating good homogenization techniques, accurate soil concentrations of lead can be obtained in the field. This data may be categorized as definitive and used for decision making at the site, if the data correlates to data generated from an approved, off-site accredited laboratory. After field sampling occurred the correlation was calculated and the action level was lowered to 261 mg/kg. This is discussed in detail in **Section 5.4**.

4.5.1.2 X-Ray Fluorescence Field Sampling Methods

Prior to commencing fieldwork, a sampling proposed sample figures were prepared to initially determine sample locations for lead analysis. The field team used these proposed sample locations to initiate sample collection in the field. The total number of samples proposed for the Hancock Field ANGB CSE Phase II investigation was twenty-nine (29). During the field investigation eighty (80) samples were collected and analyzed, fifty-four (54) in the Small Arms Range and Shooting-In Buttress (SR001) and twenty-six (26) from the Firing-In Buttress (SR002). Sample results exceeding an established field action level determine where additional samples need to be collected for delineation purposes. An overview of the XRF decision logic is presented in **Figure 4-1.**

In the field, the sample team utilized a GeoXT to locate the proposed surface sample locations. Surface samples were taken at the first interval from 0 to 6 in below ground surface (bgs). The team marked each sample point with a pin flag that had the sample identification number written on it. All sample locations were given a sequential alpha numeric designation and location recorded with a GeoXT unit. A decontaminated trowel was used to prepare the sample area and the soil was removed and transferred to a disposable aluminum container or re-sealable plastic bag. Preparation of the sample area included removing grass or other vegetation on the surface and scraping approximately 2 mm of soil from the sample area. The soil was then removed to a depth of six inches and homogenized by mixing the soil sample until a uniform color, texture, and particle size have been achieved. Large particles (rocks, pebbles, foreign objects), organic matter (roots or other plant material), and projectile debris were removed from the sample. Any removed projectile debris was described in the sample log and included in the sample location photograph. The prepared soil sample contained enough soil to fill an 8-ounce bag. The prepared soil was transferred from the container to a new clear plastic bag with the appropriate identification. The sample identification number consists of an alphanumeric designation related to the event, screening sample (as appropriate), location, media type, and quality control (QC) sample (as appropriate), according to the following convention:

Event: C = CSE Phase II Sample.

Sample: XR = XRF Sample.

Installation: HF = Hancock Field ANGB.

Location: 01 = Small Arms Range and Shooting-In Buttress (SR001).
02 = Firing-In Buttress (SR002).

Media Type: SS = Surface Soil (0-6 in).
SB1 = Subsurface Soil (6-12 in).
SB2 = Subsurface Soil (12-18 in).
SB3 = Subsurface Soil (18-24 in).
SB4 = Subsurface Soil (24-30 in).
SB5 = Subsurface Soil (30-36 in).

QC Sample: MS/MSD = Matrix Spike/Matrix Spike Duplicate.

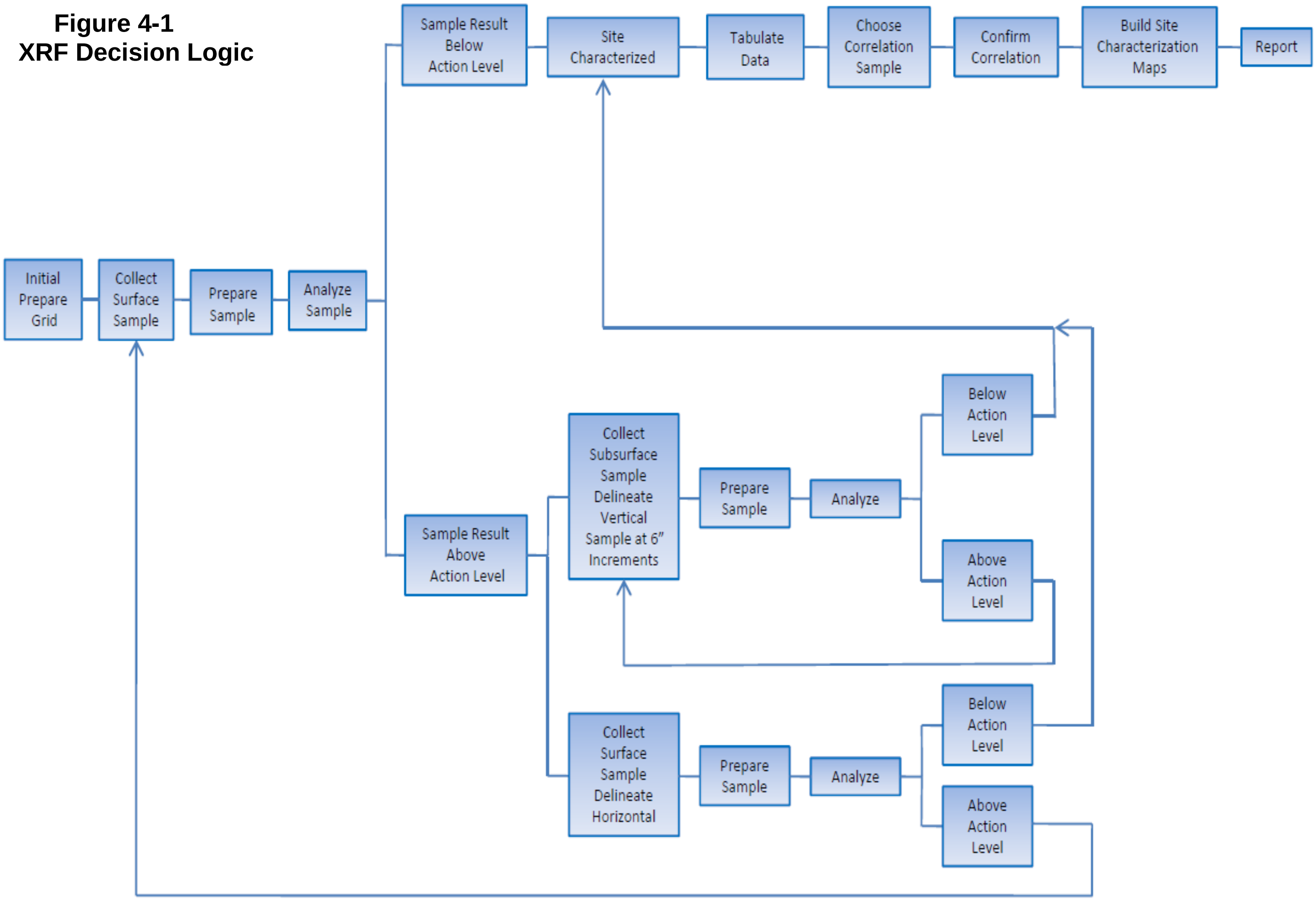
The labeled sample bag was photographed next to the sample point and organized for analysis. Once surface samples were collected, a shielded XRF test stand was set up and samples were analyzed on-site. The sample was evaluated for moisture content. A member of the field crew performed field moisture estimate test, in accordance with USDA guidelines (USDA, 1998) and SKY SOP-100, on the soil sample to estimate moisture content. If the moisture content could not be determined through the field moisture estimate test, the field crew used a moisture meter to determine if the moisture content was below 20%. If the sample was estimated to be greater than 20% moisture content it was re-homogenized and air dried until the sample was below 20% moisture content. Soil samples were analyzed on-site utilizing XRF as outlined in Sky Research SOP 100 and following the procedures below.

Four (4) XRF instrument readings of 30 seconds each were collected per sample. Each reading was collected within the same bag, at the four quadrants of the sample bag. The four XRF readings were averaged to give the final result that will be used as definitive data for decision making. To ensure instrument precision, the relative standard deviation of the four instrument readings was calculated in the field immediately after the analysis. Samples with greater than 20% relative standard deviation (RSD) were re-homogenized and analyzed again. If the four readings had a RSD greater than 20% the sample was re-homogenized, inspected for projectile debris, and immediately re-analyzed. Data from the XRF display were manually recorded on XRF data forms and stored electronically in the XRF data logger. The 20% RSD criteria does not apply for lead concentrations less than 50 mg/kg or greater than 1,000 mg/kg because results that are less than 50 mg/kg and greater than 1,000 mg/kg are an order of magnitude lower and higher than the action level. The precision requirement of 20% is less achievable as the data approach the limits of the linear range of the instrument. Not applying the 20% RSD requirement at the limits of the linear range has been found to not adversely affect the decisions made with the data generated.

When sample analysis indicated lead concentrations above the 350 mg/kg field screening level, additional surface soil samples were taken in four opposite directions at approximately 50 foot intervals or half-way to the closest result below the action level, working away from the original sample point until results were below the screening level to delineate the horizontal extent of contamination. Depth samples were taken at 6-inch increments until results were below the screening level to delineate the vertical extent of contamination. The delineation was performed to meet the ANG objective of providing data to accurately scope future remedial/removal actions where lead is the primary driver (i.e. Small arms ranges, shooting-in buttresses, etc), if warranted. All samples were processed in the same fashion as the initial surface soil samples.

The XRF sample data were downloaded from the XRF Analyzer and exported to an Excel spreadsheet. Results were evaluated by comparing the lead results to the USEPA residential screening level of 400 mg/kg. The field team used 400 mg/kg as the definitive action level, but 350 mg/kg was used as a guide in the field to determine if additional samples should be collected for delineation. Following this evaluation, representative samples were selected for off-site laboratory analysis to correlate the XRF results.

Figure 4-1
XRF Decision Logic



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4.5.1.3 X-Ray Fluorescence Correlation Samples

At the conclusion of the XRF sampling, 12 correlation samples (and one field duplicate) were selected and sent to an off-site laboratory for analysis to correlate the XRF data. Correlation samples were collected based on lead concentration (4 low, 4 medium, 4 high concentrations are preferred), low RSD values, and absence of projectile debris. The range of results for the correlation samples was 25 to 585 mg/kg. The correlation results are presented in **Section 5.4**.

4.5.1.4 X-Ray Fluorescence Quality Control Procedures

A Niton XL3t XRF analyzer with test stand was used for on-site XRF analysis. Internal diagnostics checks were automatically initiated each time the instrument was powered on. During the internal diagnostics the back of the metal shutter near the measurement window were analyzed. The known metal concentrations of the shutter are automatically compared to the measured values to ensure proper operation. If a problem with the instrument diagnostics test occurred, an error message was reported by the analyzer. No problems were reported encountered with the instrument diagnostics test during the field work conducted at Hancock Field ANGB.

Quality Control checks were performed daily to ensure that the analyzer calibration was within specification and functioning properly. An energy calibration test was conducted at the beginning and end of each day. The energy values are computed by the analyzer and compared to the manufacturer derived calibration values. If the two values are within 20% of each other the energy calibration test passes. Each test result obtained at Hancock Field ANGB was within 20% of the manufacturer derived calibration value.

A standard reference material test was performed every four hours using three different standards from the manufacturer. The three standards included a low lead concentration of 50 mg/kg, a medium lead concentration of 500 mg/kg and a high concentration of 2700 mg/kg. Each standard was measured for at least 30 seconds; the measured values were compared to the known concentrations, if the two values were within 20% of each other the standard reference material passed. Any measured value greater than 20% of the standard reference material was re-measured and passed.

A third test performed every four hours was the system blank test. The system blank test assured there was no contamination present within the analyzer. The system blank consists of a silicon dioxide reference material measured for at least 30 seconds by the XRF analyzer. If the analyzer reported values below the limits of detection (LOD) the absence of lead within the analyzer or on the measurement platform was confirmed. The LOD is the threshold at which the Niton XL3t XRF instrument can detect lead contamination with the 95% probability (2 sigma). The LOD is determined empirically by evaluating the site specific XRF measurements. The lowest detected value is used as the LOD. The LOD for Hancock Field ANGB is approximately 13 mg/kg. Each system blank test resulted in a reported value <LOD.

A precision measurements test was performed daily. The 500 mg/kg RCRA standard was measured seven times in replicate and the percent relative standard deviation (%RSD) computed. The precision measurements test passed if the computed %RSD was less than or equal to 20%. For each precision measurement test at Hancock Field ANGB the %RSD was within the required 20%.

All XRF calibration and Quality Assurance (QA) tests for the Hancock Field ANGB CSE Phase II project passed. The field notes and forms can be found in **Appendix E.**

4.5.1.5 Off-site Laboratory Lead Analysis

XRF sampling and correlation results are discussed in detail in **Section 4.5.1** and **Section 5.4**, respectively. Twelve XRF samples (and one blind duplicate) were split for off-site laboratory analysis of lead to correlate XRF sample results. Complete analytical data are provided in **Appendix G**.

4.5.1.6 Off-site Laboratory Sample Preparation

Correlation samples were selected as described in **Section 5.4**. Once the samples were chosen, the XRF sample bag was obtained and an aliquot of the soil was transferred directly from the sample bag to appropriate sample jars, packaged and shipped to the off-site laboratory utilizing the lab chain of custody form (see **Figure 4-2**). All sample handling, preparation, and shipment were performed in accordance with the UFP-QAPP as described in **Section 4.6** of this report.

4.5.1.7 Off-site Laboratory Lead Methodology

Lead was analyzed using an inductively coupled plasma (ICP) analyzer. For soil samples, USEPA SW-846 Method 3050B was used for digestion and Method 6010B was used for analysis. The analytical services for the sampling effort were provided by Test America, Inc. located in Denver, Colorado, a National Environmental Laboratory Accreditation Conference (NELAC) and Air Force Center for Engineering and the Environment (AFCEE) accredited laboratory. The analytical procedures adhered to the *DoD Quality Systems Manual for Environmental Laboratories, Version 3* (DoD, 2006). The surface soil and subsurface soil samples were analyzed according to *USEPA Third Edition, Test Methods for Evaluating Solid Waste,* (SW-846) Update IVB (USEPA, 2007), as well as laboratory SOPs for this project. The analytical scope included analysis for lead by USEPA SW-846 Method 6010B.

4.5.1.8 Off-site Laboratory Lead Analysis Quality Control

The laboratory lead quality control procedures are presented in **Section 4.6.3**.

4.5.1.9 Off-Site Laboratory Data Quality Assurance

This section discusses the evaluation of the common quality control checks. The required QC checks, the frequency for the checks, and the acceptance criteria for the checks, are listed in the project-specific UFP-QAPP, the DoD Quality Systems Manual (QSM), laboratory SOPs, and analytical methodologies. The purpose of preparing and analyzing QC samples is to demonstrate, through the known entities, how accurate and precise the investigative sample data are.

Test America continuously evaluates the quality of the analytical process in order to assure validity of the data. The analytical process is controlled not only by instrument calibration and routine process quality control measurements (e.g., blanks, laboratory control samples [LCSs], matrix spike/matrix spike duplicate [MS/MSD], surrogates, Internal Standards). These QC checks are performed as required by the method or regulations to assess precision and accuracy. In addition to the routine process QC samples, Proficiency Testing (PT) samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

Sample preparation or pre-treatment is commonly required before analysis. Preparation steps may include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying, and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control Samples (e.g. QC indicators) are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

Control samples provide a means to evaluate data based upon (1) Method Performance (LCS or Blank Spike [BS]) which entails both the preparation and measurement steps; and (2) Matrix Effects (MS/MSD or DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch.

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Figure 4-2 Laboratory Chain of Custody

Chain of Custody Record

4124 (0907)

Temperature on Receipt ______

Drinking Water? Yes ☐ No ☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client	Project Manager	Date	Chain of Custody Number 407843
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page ______ of ______
City / State / Zip Code	Site Contact / Lab Contact	Analysis (Attach list if more space is needed)	
Project Name and Location (State)	Carrier/Waybill Number		Special Instructions/ Conditions of Receipt
Contract/Purchase Order/Quote No.	Matrix / Containers & Preservatives		

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil		Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH														Special Instructions/ Conditions of Receipt

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ______ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other______

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

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4.6 Data Quality Approach

Quality Assurance is defined as the overall system for assuring the reliability of data produced. The system integrates quality planning, assessment, and improvement efforts from various groups in an organization to provide and maintain an effective system for collection and analysis of environmental samples and related activities. The QA program encompasses the generation of valid and complete data through its subsequent review, validation, and documentation. This section summarizes the QA and QC procedures and presents the results of the QC assessment of the analytical data acquired during the November 2009, field event at Hancock Field ANGB. All procedures were conducted in accordance with the Hancock Field ANGB Comprehensive Site Evaluation Phase II Final Work Plan (USACE, 2010).

The Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) was developed as part of the CSE Phase II sampling and analysis plan. It was implemented through the integration of well-defined QC elements for activities associated with the task assignment. The QC criteria defined for sampling and analysis activities were developed in accordance with specifications contained in the USACE, EM 200-1-3, Requirements for the Preparation of Sampling and Analysis Plans, (USACE, 2001), USEPA Systematic Planning: A Case Study for Hazardous Waste Site Investigation, QA/CS-1 (USEPA, 2006) and the DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006a). The Hancock Field ANGB QAPP was prepared in accordance with the Uniform Federal Policy for Quality Assurance Project Plans (USEPA, 2005).

Documentation required for this project was reviewed and deficiencies, if any, were identified. Required project documentation included the following:

- **Field Forms**: Field Forms with numbered pages were used to log daily activities and data collected during the course of field activities. Designated forms were also used to record calibration records and equipment maintenance as they were performed.
- **Chain-of-Custody**: Samples for off-site analysis were collected and relinquished under stringent chain-of-custody protocols as specified in the project QAPP. A review of chain-of-custody forms indicates that all sample collection, identification, and project information was correctly supplied.
- **Document Control**: Documents generated by or provided for the SKY Team in support of project activities were input into the SKY Team Document Control System.

Sampling activities were performed in compliance with SOPs, and each individual performing sampling was aware of the requisite protocols for collection of environmental samples. Each sample technician was experienced in soil characterization and sampling techniques for the media collected. Team members were provided with copies of the associated Work Plan which included the Field Sampling Plan, QAPP and the Accident Prevention Plan and Site Safety and Health Plan (APP/SSHP).

4.6.1 Data Quality Objectives

The DQOs were developed and presented in the CSE Phase II work plan. DQOs were developed concurrently with the Work Plan to ensure 1) the reliability of field sampling and chemical/field analyses; 2) the collection of sufficient data; 3) the quality of data generated was acceptable for its intended use; and 4) valid assumptions could be inferred from the data.

For the analytical data, attainment of DQOs was assessed through evaluation of all data collected using the following data quality indicators (**Table 4-2**):

- Precision – a quantitative measure of the variability of a group of measurements in comparison to the average value measured using relative percent difference (RPD) or percent difference (%D). This included evaluating field sample duplicates, XRF standard reference material analysis, laboratory sample duplicates, and MS/MSD.
- Accuracy – the bias in a measurement system measured using percent recovery (%R). This included evaluating laboratory control samples, matrix spikes, and serial dilution in the field, XRF standard reference material tests were performed routinely, and the relative standard deviation of multiple runs were calculated for the standards, and all sample results
- Representativeness – the degree to which the measured results accurately reflect the medium being sampled. Representativeness is assessed based on accuracy, precision, and completeness. This includes evaluating holding times method blanks and laboratory control systems.
- Completeness – the percentage of measurements which are judged to be useable as compared to the planned number of measurements needed to fulfill the requirements outlined in the DQOs. This included evaluating sampling and analytical completeness.
- Comparability – defined as a qualitative parameter expressing the confidence with which one data set can be compared with another. This includes evaluating the analytical methods performed.
- Sensitivity – describes the method detection limits (MDLs), quantitation limits, and method reporting limits (MRLs), which are dependent upon the sample characteristics (i.e., sample volumes used, percent solids, dilutions, etc.) and the analytical method performed. It also may be expressed as the slope of the analytical curve (intensity verses concentration). The MDL and MRL sensitivities were evaluated for each sample and reported analyte.

Table 4-2 Data Quality Indicators

Data Quality Indicator	Definition	Goal	Sampling Assessment	Analytical Assessment
Precision	Quantitative measure of the variability of a group of measurements in comparison to the average value (RPD or %D).	Low RPD	Field duplicate samples.	MS/MSD or lab sample duplicate; Field sample duplicate; RCRA 500 mg/kg standard precision measurement test.
Accuracy	Bias in a measurement system (%R).	Low bias	Blank contamination.	Analysis spike results [LCS, MS/MSD, surrogates]; XRF standard reference materials test.
Representativeness	Degree to which the measured results accurately reflect the medium being sampled.	High	Holding times, blanks, associated documentation.	Inferred from accuracy, precision, and completeness evaluation.
Completeness	Percentage of measurements which are judged to be usable (%R).	>90%	Records review.	Data validation.
Comparability	Qualitative parameter expressing the confidence with which one data set can be compared with another.	High	Work plans, quality documents.	Analytical methods.
Sensitivity	Quantitative measure of the level of detection and quantitation.	High	Review of analytical method or procedures and instrumentation.	Analysis of MDLs and MRLs per analyte, analytical method, and matrix.

4.6.2 Data Review

All analytical data packages were provided to the SKY team in Contract Laboratory Program (CLP) – like Level IV data deliverables with Environmental Restoration Program Information Management System (ERPIMS) and American Standard Code for Information Interchange (ASCII) delimited electronic data deliverable files from the laboratory. Detected target compound values above the project reporting limit and within the acceptable calibration range were reported as determined to no more than three significant figures. Target analytes detected below the project reporting limit, but above the NYL, were reported as estimated values. Laboratory data qualifiers are available in the analytical data packages. The data validation qualifiers are discussed in the following section and located in **Appendix H**. All final data qualifiers are also captured in the electronic database.

4.6.3 Data Validation

All analytical results, in support of this CSE Phase II sampling effort, were independently evaluated by the Sky Team Data Validation Specialist. Data review and validation of the analytical data was based on the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA, 1999), and the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA, 2004). In conjunction with the data validation guidelines, the SKY team examined the project specific DQOs, the DoD QSM, method-specific criteria, and the laboratory SOPs to determine the overall usability of the analytical results.

All analytical data packages were validated to ensure compliance with specified analytical, QA/QC requirements, data reduction procedures, data reporting requirements and required accuracy, precision, and completeness criteria.

The following parameters were evaluated during the data validation process:

- Analyte identification.
- Sample Preservation and Technical Holding times.
- Blank Analysis.
- GC/MS Instrument Performance Check.
- Initial and Continuing Calibrations.
- Laboratory Control Sample.
- Matrix Spike/Matrix Spike Duplicate.
- Laboratory and Field Duplicates.
- Quantitation Verification.

If these parameters for the site-specific analyses did not meet the USEPA criteria, a discussion of the implications in regard to the guidelines appears in the data validation report narratives. Parameters outside guidelines do not necessarily indicate that the result is invalid. The decision of validity is made by the professional validator based on the USEPA guidelines referenced herein. Complete validation report narratives for all the analytical results, as well as a glossary of QA/QC terms and data qualifier codes, can be found in **Appendix H**. Overall the quality of these analytical results was considered acceptable. No major issues were identified. The following is a summary of the findings identified during the data validation process.

The lead analyses met QC criteria for holding times, calibrations, blank analyses, ICP interference check samples, MS/MSD recoveries, LCS recoveries, ICP serial dilutions, field duplicates and compound quantitation. All lead results were considered acceptable without qualification.

The data validation reports are presented in **Appendix H**.

4.7 Data Management

The integration of a team concept to data management, the routine use of customized software programs, a web-based project network and the use of computer applications has revolutionized the way in which the SKY team collects, processes, interprets, reports, and manages site data. These tools enable us to perform the tasks outlined in the following sections.

4.7.1 Electronic Data

The electronic files for the Hancock Field ANGB CSE Phase II project were securely stored within an individual project directory on a secure network located at the SKY office in Centennial, Colorado. File access is restricted to only those personnel with critical involvement in the project and who have been granted access by the SKY Project Manager (PM). These electronic files are backed-up daily, weekly, monthly, and yearly. Applicable data from the CSE Phase II will be entered into the DMT.

4.7.2 Hardcopy Data

The hardcopy project files (including work plans, technical reports, figures, and drawings) are stored within a secure Hancock Field ANGB project file located at the SKY office in Centennial, Colorado. Access to the office is limited to SKY personnel though a door security system.

4.7.3 Geographical Information System Data

All project GIS data files are stored within an individual project directory under the secure private network located at the SKY office in Centennial, Colorado. Again, file access is restricted to only those personnel with critical involvement in the project and who have been granted access rights. These electronic files also are backed-up daily, weekly, monthly, and yearly.

The conversion of raw data into the database and mapping software was performed at SKY's Centennial, Colorado office. CSE Phase II data were stored and managed using GIS software. Field data collected during sampling was entered manually into the database and QC'd by another member of the field team. The output from the database was checked by the QC Specialist or his designee to determine if it was consistent with the raw data.

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5.0 Field Investigation Results

This section describes specific characteristics and results of the CSE Phase II investigation for the Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002) MRAs that were addressed under the CSE Phase II activities performed at Hancock Field ANGB.

5.1 Summary of Samples Taken Per MRA

Visual surveys and environmental sampling were employed during the CSE Phase II investigation. The numbers of samples collected and analysis performed (including duplicate samples) are summarized in **Table 5-1**. Results for each MRA are presented in **Sections 5.2** through **5.3**.

Table 5-1 Summary of Samples Obtained During the CSE Phase II Field Activities

Parameters	USEPA Method	Media	Samples
Site 01 Small Arms Range and Shooting-In Buttress (SR001)			
Lead by XRF	6200	Surface Soil/ Subsurface Soil	40/14
Lead by ICP	6010B	Surface Soil	10 plus 1 duplicate
Site 02 Firing-In Buttress (SR002)			
Lead by XRF	6200	Surface Soil/Subsurface Soil	23/3
Lead by ICP	6010B	Surface Soil	2

5.2 Small Arms Range and Shooting-In Buttress (SR001)

5.2.1 Site Description

The Small Arms Range and Shooting-In Buttress (SR001) is located in the south-central portion of Tract II. The southern portion of the area extends beyond the Tract II boundary and onto land currently owned by the City of Syracuse. According to the Commissioner of the Airport the land was transferred in 1999. The area consists of vacant land with remnants of the small arms facilities and is discussed in detail in **Section 5.2.7.1**. The range is rectangular with berms on the north, south, and east sides of the live fire area. The MRA measures 619 ft by 435 ft with a perimeter of 1,623 ft. The coordinates of the area are 43.1178376821 degrees latitude, 76.0883902690 degrees longitude. Soils in the area include Minoa fine sandy loam and cut and fill land. Average depth to groundwater is approximately 3.0 ft. An area of 0.033 acres lies outside of the installation boundary.

5.2.2 History of Munitions and Explosives of Concern Activities

The MRA consists of a former shooting-in buttress, small arms facilities, and gas instruction buildings. Buildings 465 and 466 were constructed in 1971 and located in this area, just south of the range. Building 465 was used for gas mask training, and Building 466 was used as a repair facility and for range training storage. Both buildings were demolished 15 October 2007.

Additionally, information has been identified that the access path to the small arms area was used for M-203 training with 40mm practice grenades. The shooting-in buttress was constructed during the WWII era. No specific information regarding the types of munitions, frequency of use, or when usage stopped was identified. However, the shooting-in buttress berm appears to be in place and active in the 1956 aerial photograph. The small arms range facility was constructed in the 1960s and used for training by Hancock Field personnel, the NY ANG, local reserve units, and local police. During construction of the small arms range, it appears that the shooting-in buttress berm was removed at that time. Potentially, the shooting-in buttress berm could have been used to construct some of the small arms range berm. Small arms use after 1986 consisted of 5.56-mm and 9-mm ball munitions. Historic use likely included 7.62-mm, .38-caliber, .45-caliber, and .50-caliber munitions. Use of the small arms range was discontinued in 2002. Soil at the site has been reworked by large machinery for maintenance. As a result, expended munitions may be present at the surface or in subsurface soils. Currently the range is abandoned but accessible to the public. There is evidence of random civilian small arms use.

5.2.3 Land Use

The site currently consists of vacant land with remnants of the small arms facilities which are discussed in detail in **Section 5.2.7.1**. The vegetation is overgrown and consists of heavy shrubs with trees. The majority of the area is situated in Tract II, which is part of installation property. The southern portion extends beyond Tract II onto land owned by the City of Syracuse.

5.2.4 Access Controls

The Department of the Air Force owns the land and grants use of the property to the New York Air National Guard. Most of this site is located on property managed by Hancock Field ANGB though a portion of the site is located on land owned by the City of Syracuse (See **Figure 5-1**). There are limited access controls specific to this site. There is a chain link fence around part of the MRA. The fence is open at the access point into the MRA and no gate is present.

5.2.5 Restrictions

The Small Arms Range and Shooting-In Buttress (SR001) is accessible to the public. Evidence of civilian use is present in the form of abandoned furniture and trash as well as informal shooting targets such as trash cans, plastic and paper silhouettes, and a Styrofoam deer hunting target.

5.2.6 Receptors

5.2.6.1 Nearby Population

Hancock field is located at the Syracuse Hancock International Airport. It is located approximately five miles north of the City of Syracuse, in Onondaga County. According to the U.S Census, there are approximately 579 persons per square mile in Onondaga County (U.S. Census, 2010).

5.2.6.2 Buildings near/within MRA

There are no buildings within this MRA. This area is located in an undeveloped area of Hancock Field. Within a two mile radius of this MRA there are over 26 inhabited buildings, including educational facility, church, hospital, commercial building, and parks.

5.2.7 Field Investigation Results

5.2.7.1 Visual Survey Results

Visual survey transects were completed at the MRA as shown in **Figure 5-1**. The northeast section of the Small Arms Range and Shooting-In Buttress (SR001) and areas on either side of the road could not be surveyed due to thick vegetation, which prohibited access and/or visual inspection of the ground.

The Small Arms Range and Shooting-In Buttress (SR001) contains limiting safety berms located to the north and south and one impact berm to the east. These berms range in height from 12 to 15ft. and are densely vegetated. Transects were walked on top of all berms with good ground visibility on the north and south berms and limited to no ground visibility on the impact berm.

Evidence of small arms activity was observed within the MRA. A concrete firing pad remains on the western extent of the range, where multiple small arms casings of various calibers were observed. Remnants of large target frames made of wooden utility poles were found throughout the range. Many target structures remain upright and have small arms projectiles imbedded in the front sides.

A southwest to northeast road runs through the middle of the MRA parallel to the southern range limiting berm and terminates near the impact berm. MD consisting of 40mm practice grenade debris was observed along the length of this road. Remnants of a metal smoke canister (non-HE) and non-lethal offensive grenade debris were also observed in the vegetation south of the road.

In the southwest portion of the MRA, small arms casings, projectiles, shotgun shells and clay target debris were observed in areas with ground visibility.

The main findings at the Small Arms Range and Shooting-In Buttress (SR001) included the following:

- Small arms casings of various caliber.
- Small arms lead projectiles of various caliber.
- 40mm practice grenade debris.
- Smoke canister debris.
- Non-Lethal Offensive Grenade debris.
- Practice target structures.
- Small amounts of clay target debris.

Photos of items observed at the Small Arms Range and Shooting-In Buttress (SR001) during CSE Phase II visual surveys are presented in **Appendix D**.

5.2.7.2 Soil Sampling Results

During the visual survey there were no items observed that would constitute a significant release of MC from MEC items, therefore MC sampling associated with MEC items was not performed at this MRA. No MC sampling for explosives was conducted.

MC sampling for lead was performed at this MRA. XRF sampling was performed for possible lead contamination related to small arms use. XRF samples and the associated correlation samples were collected from this MRA and discussed below.

5.2.7.2.1 On-Site X-Ray Fluorescence Sampling and Analysis

There were 54 soil samples collected at the Small Arms Range and Shooting-In Buttress (SR001) for on-site XRF lead analysis. Lead was detected at concentrations ranging from 22 mg/kg to 5217 mg/kg. Eight soil samples exceeded the 400 mg/kg action level and required horizontal and vertical delineation. Sample locations and results are presented in **Figure 5-2**.

Small arms debris was observed in several soil samples. A summary of these items are presented in **Section 5.2.7.1** and **Appendix D**. A summary of the XRF results are presented in **Table 5-2**. Lead contamination and munitions response site designations are discussed in **Section 13.0**.

The results of the Human Health Risk Assessment (HHRA) are discussed in **Section 9.4** and the results of the Screening Level Ecological Risk Assessment (SLERA) are discussed in **Section 10.0**.

5.2.7.2.2 Off-Site Laboratory Lead Analysis

Ten of the 54 samples collected for on-site XRF lead analysis from the Small Arms Range and Shooting-In Buttress (SR001) were selected for off-site lead analysis for correlation of the XRF data. In addition, one blind duplicate sample was submitted for this site.

The laboratory correlation (see **Section 5.4** for details) resulted in a correlation coefficient (r) below the acceptable range. Sample C-XR-HF-01-SS-109 was removed from the correlation analysis due to the likelihood of lead debris in the sample causing the large discrepancy in field and laboratory results. The RPD calculated from the duplicate results was high, which also indicates a lack of sample homogeneity. Because of these results, the action level was lowered from 400 mg/kg to 261 mg/kg, which is the field measured lead value for sample C-XR-HF-01-SS-109. Sixteen of the 54 samples exceeded this modified action level.

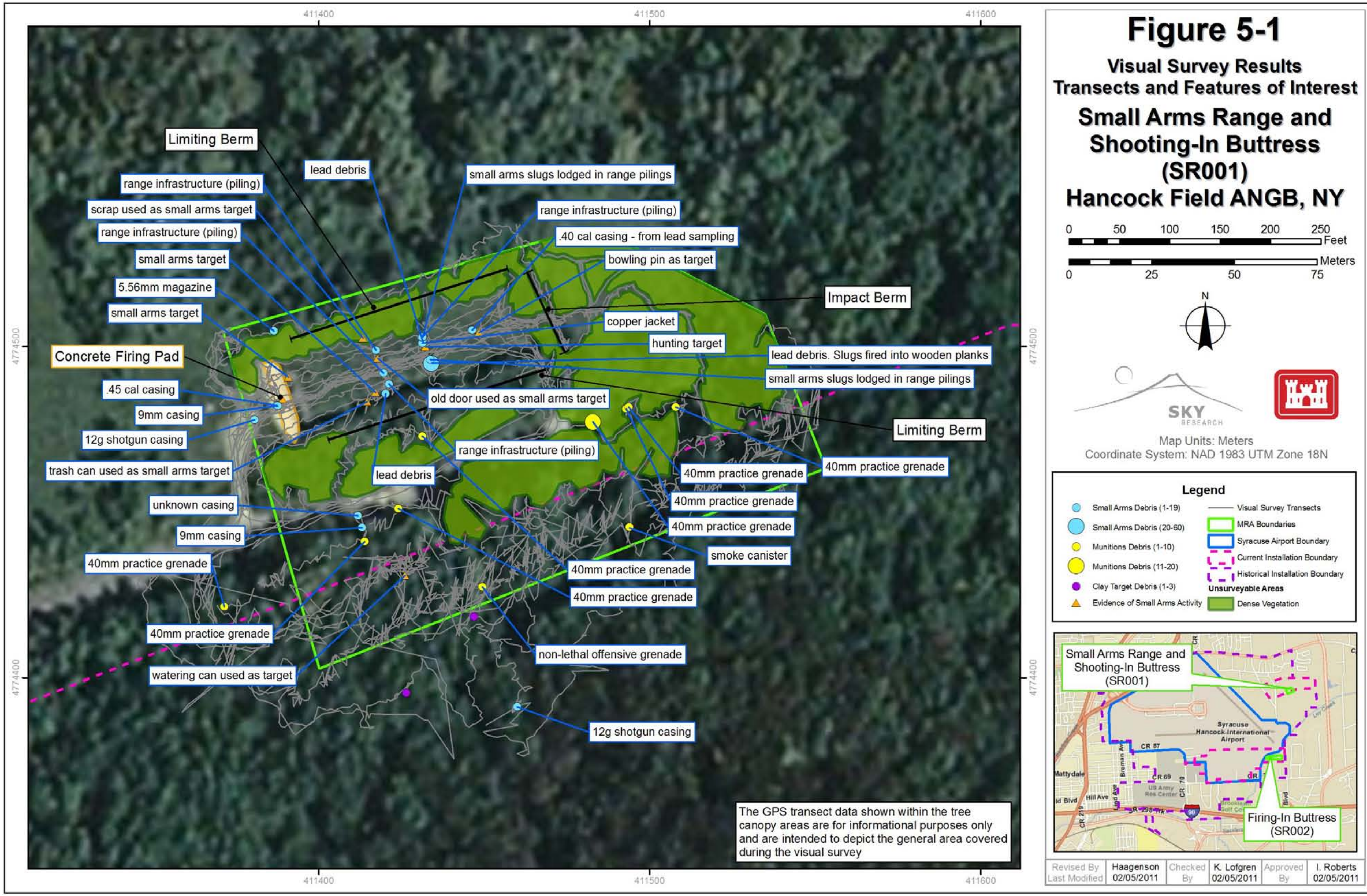
Figure 5-1
Visual Survey Results
Transects and Features of Interest
Small Arms Range and Shooting-In Buttress (SR001)
Hancock Field ANGB, NY
Limiting Berm
lead debris
range infrastructure (piling)
scrap used as small arms target
small arms slugs lodged in range pilings
.40 cal casing - from lead sampling
bowling pin as target
small arms target
5.56mm magazine
Impact Berm
copper jacket
hunting target
Concrete Firing Pad
lead debris. Slugs fired into wooden planks
.45 cal casing
9mm casing
old door used as small arms target
12g shotgun casing
range infrastructure (piling)
trash can used as small arms target
40mm practice grenade
unknown casing
smoke canister
non-lethal offensive grenade
watering can used as target
The GPS transect data shown within the tree canopy areas are for informational purposes only and are intended to depict the general area covered during the visual survey
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
Small Arms Debris (1-19)
Small Arms Debris (20-60)
Munitions Debris (1-10)
Munitions Debris (11-20)
Clay Target Debris (1-3)
Evidence of Small Arms Activity
Visual Survey Transects
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Unsurveyable Areas
Dense Vegetation
Small Arms Range and Shooting-In Buttress (SR001)
Firing-In Buttress (SR002)
Revised By Last Modified Haagenson 02/05/2011
Checked By K. Lofgren 02/05/2011
Approved By I. Roberts 02/05/2011

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Table 5-2 XRF Sampling Results, Small Arms Range and Shooting-In Buttress (SR001)

Sample ID	Analysis Date/Time	Depth	Small Arms Debris	Final Pb, mg/kg	% RSD
C-XR-HF-01-SS-004	9/11/2010 14:57	0 - 6 inches	None	100	7
C-XR-HF-01-SS-009	**9/11/2010 10:27**	**0 - 6 inches**	**None**	**336**	**7**
C-XR-HF-01-SS-101	**9/11/2010 11:01**	**0 - 6 inches**	**lead debris**	**648**	**6**
C-XR-HF-01-SB1-101	9/13/2010 13:23	6 - 12 inches	None	88	6
C-XR-HF-01-SS-102	9/11/2010 9:29	0 - 6 inches	lead debris (proj)	234	4
C-XR-HF-01-SS-103	**9/11/2010 15:11**	**0 - 6 inches**	**lead debris**	**630**	**13**
C-XR-HF-01-SB1-103	9/14/2010 14:41	6 - 12 inches	None	158	2
C-XR-HF-01-SS-104	**9/11/2010 11:42**	**0 - 6 inches**	**None**	**1804**	**NA**
C-XR-HF-01-SB1-104	**9/14/2010 13:40**	**6 - 12 inches**	**None**	**278**	**18**
C-XR-HF-01-SS-105	**9/11/2010 9:44**	**0 - 6 inches**	**lead debris**	**4096**	**NA**
C-XR-HF-01-SB1-105	**9/13/2010 12:27**	**6 - 12 inches**	**copper jacket**	**371**	**12**
C-XR-HF-01-SB2-105	9/13/2010 16:39	12 - 18 inches	lead flakes removed	141	14
C-XR-HF-01-SS-106	**9/11/2010 13:15**	**0 - 6 inches**	**None**	**302**	**16**
C-XR-HF-01-SB1-106	9/14/2010 12:54	6 - 12 inches	None	60	11
C-XR-HF-01-SS-107	9/11/2010 13:55	0 - 6 inches	None	56	17
C-XR-HF-01-SS-108	9/11/2010 13:35	0 - 6 inches	None	257	14
C-XR-HF-01-SB1-108	9/14/2010 14:23	6 - 12 inches	None	50	16
C-XR-HF-01-SS-109	**9/11/2010 13:47**	**0 - 6 inches**	**None**	**261**	**4**
C-XR-HF-01-SB1-009	9/13/2010 13:46	6 - 12 inches	None	229	8
C-XR-HF-01-SS-110	**9/11/2010 11:31**	**0 - 6 inches**	**lead debris (proj)**	**4411**	**NA**
C-XR-HF-01-SB1-110	9/14/2010 14:33	6 - 12 inches	None	123	14
C-XR-HF-01-SS-111	**9/11/2010 12:52**	**0 - 6 inches**	**None**	**1009**	**NA**
C-XR-HF-01-SB1-111	9/14/2010 15:13	6 - 12 inches	None	124	12
C-XR-HF-01-SS-112	**9/11/2010 10:43**	**0 - 6 inches**	**lead debris**	**5217**	**NA**
C-XR-HF-01-SB1-112	**9/14/2010 13:12**	**6 - 12 inches**	**None**	**902**	**11**
C-XR-HF-01-SB2-112	**9/14/2010 12:36**	**12 - 18 inches**	**None**	**323**	**13**
C-XR-HF-01-SB3-112	9/15/2010 14:57	18 - 24 inches	None	172	3
C-XR-HF-01-SS-113	9/11/2010 15:03	0 - 6 inches	None	97	7
C-XR-HF-01-SS-114	**9/11/2010 11:13**	**0 - 6 inches**	**None**	**309**	**13**
C-XR-HF-01-SB1-114	9/13/2010 15:08	6 - 12 inches	5.56 casing	64	16
C-XR-HF-01-SS-151	**9/11/2010 14:03**	**0 - 6 inches**	**None**	**294**	**14**
C-XR-HF-01-SS-152	9/11/2010 12:02	0 - 6 inches	None	49	NA

Sample ID	Analysis Date/Time	Depth	Small Arms Debris	Final Pb, mg/kg	% RSD
C-XR-HF-01-SS-153	9/11/2010 14:28	0 - 6 inches	lead debris	73	14
C-XR-HF-01-SS-154	9/11/2010 16:31	0 - 6 inches	None	69	10
C-XR-HF-01-SS-155	9/13/2010 11:39	0 - 6 inches	skeet target debris	29	20
C-XR-HF-01-SS-156	9/13/2010 12:02	0 - 6 inches	None	47	NA
C-XR-HF-01-SS-157	9/13/2010 13:33	0 - 6 inches	None	47	NA
C-XR-HF-01-SS-158	9/11/2010 15:37	0 - 6 inches	None	46	6
C-XR-HF-01-SS-301	9/13/2010 10:33	0 - 6 inches	None	25	NA
C-XR-HF-01-SS-302	9/13/2010 10:40	0 - 6 inches	None	29	NA
C-XR-HF-01-SS-303	9/14/2010 15:06	0 - 6 inches	None	43	NA
C-XR-HF-01-SS-304	9/13/2010 13:16	0 - 6 inches	None	178	9
C-XR-HF-01-SS-305	9/14/2010 13:57	0 - 6 inches	None	43	NA
C-XR-HF-01-SS-306	9/14/2010 13:05	0 - 6 inches	None	36	NA
C-XR-HF-01-SS-307	9/14/2010 14:14	0 - 6 inches	casing	62	9
C-XR-HF-01-SS-308	9/14/2010 13:18	0 - 6 inches	None	132	9
C-XR-HF-01-SS-401	9/14/2010 17:00	0 - 6 inches	None	37	NA
C-XR-HF-01-SS-402	9/14/2010 16:02	0 - 6 inches	None	66	8
C-XR-HF-01-SS-403	9/15/2010 13:20	0 - 6 inches	None	99	10
C-XR-HF-01-SS-601	9/15/2010 14:12	0 - 6 inches	None	78	15
C-XR-HF-01-SS-602	9/15/2010 15:03	0 - 6 inches	None	22	NA
C-XR-HF-01-SS-701	9/16/2010 11:54	0 - 6 inches	None	199	6
C-XR-HF-01-SS-702	9/16/2010 11:59	0 - 6 inches	None	30	NA
C-XR-HF-01-SS-801	9/17/2010 11:54	0 - 6 inches	None	27	NA

< LOD= below the limit of detection. The limit of detection is approximately 13 mg/kg based on the lowest observed value at Hancock Field ANGB.
mg/kg= Milligrams per kilogram.
RSD = Relative Standard Deviation.
NA = Not Applicable. Percent RSD not calculated when sample is less than 50 mg/kg or greater than1000 mg/kg. Results that are less than 50 mg/kg and greater than 1,000 mg/kg are an order of magnitude lower and higher than the action level therefore the 20% RSD criteria is not as essential for determining action level exceedance.

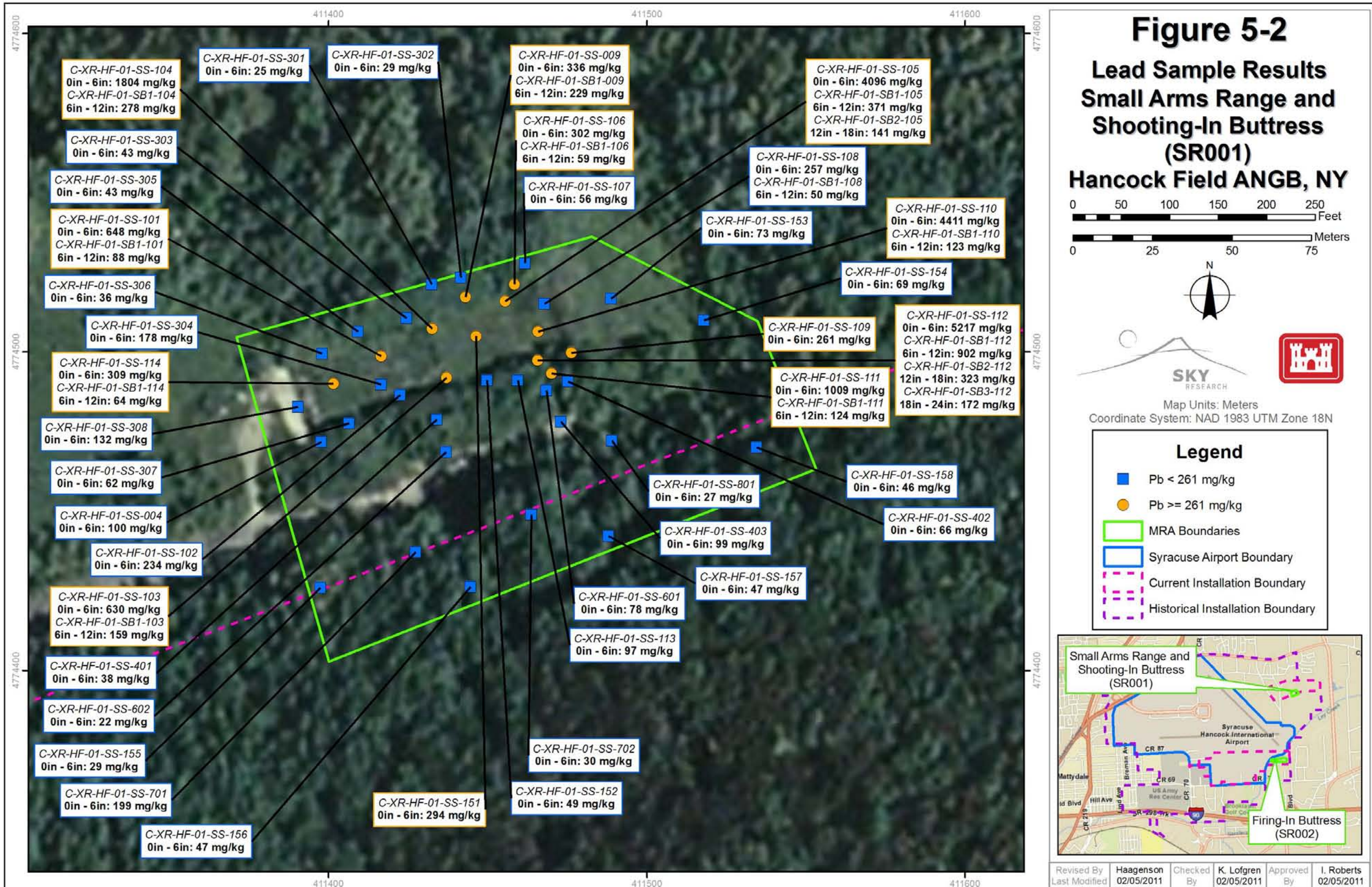
Figure 5-2
Lead Sample Results
Small Arms Range and
Shooting-In Buttress
(SR001)
Hancock Field ANGB, NY
C-XR-HF-01-SS-104 0in - 6in: 1804 mg/kg C-XR-HF-01-SB1-104 6in - 12in: 278 mg/kg
C-XR-HF-01-SS-301 0in - 6in: 25 mg/kg
C-XR-HF-01-SS-302 0in - 6in: 29 mg/kg
C-XR-HF-01-SS-009 0in - 6in: 336 mg/kg C-XR-HF-01-SB1-009 6in - 12in: 229 mg/kg
C-XR-HF-01-SS-105 0in - 6in: 4096 mg/kg C-XR-HF-01-SB1-105 6in - 12in: 371 mg/kg C-XR-HF-01-SB2-105 12in - 18in: 141 mg/kg
C-XR-HF-01-SS-303 0in - 6in: 43 mg/kg
C-XR-HF-01-SS-106 0in - 6in: 302 mg/kg C-XR-HF-01-SB1-106 6in - 12in: 59 mg/kg
C-XR-HF-01-SS-108 0in - 6in: 257 mg/kg C-XR-HF-01-SB1-108 6in - 12in: 50 mg/kg
C-XR-HF-01-SS-305 0in - 6in: 43 mg/kg
C-XR-HF-01-SS-107 0in - 6in: 56 mg/kg
C-XR-HF-01-SS-101 0in - 6in: 648 mg/kg C-XR-HF-01-SB1-101 6in - 12in: 88 mg/kg
C-XR-HF-01-SS-153 0in - 6in: 73 mg/kg
C-XR-HF-01-SS-110 0in - 6in: 4411 mg/kg C-XR-HF-01-SB1-110 6in - 12in: 123 mg/kg
C-XR-HF-01-SS-306 0in - 6in: 36 mg/kg
C-XR-HF-01-SS-154 0in - 6in: 69 mg/kg
C-XR-HF-01-SS-304 0in - 6in: 178 mg/kg
C-XR-HF-01-SS-109 0in - 6in: 261 mg/kg
C-XR-HF-01-SS-112 0in - 6in: 5217 mg/kg C-XR-HF-01-SB1-112 6in - 12in: 902 mg/kg C-XR-HF-01-SB2-112 12in - 18in: 323 mg/kg C-XR-HF-01-SB3-112 18in - 24in: 172 mg/kg
C-XR-HF-01-SS-114 0in - 6in: 309 mg/kg C-XR-HF-01-SB1-114 6in - 12in: 64 mg/kg
C-XR-HF-01-SS-111 0in - 6in: 1009 mg/kg C-XR-HF-01-SB1-111 6in - 12in: 124 mg/kg
C-XR-HF-01-SS-308 0in - 6in: 132 mg/kg
C-XR-HF-01-SS-307 0in - 6in: 62 mg/kg
C-XR-HF-01-SS-158 0in - 6in: 46 mg/kg
C-XR-HF-01-SS-801 0in - 6in: 27 mg/kg
C-XR-HF-01-SS-004 0in - 6in: 100 mg/kg
C-XR-HF-01-SS-402 0in - 6in: 66 mg/kg
C-XR-HF-01-SS-403 0in - 6in: 99 mg/kg
C-XR-HF-01-SS-102 0in - 6in: 234 mg/kg
C-XR-HF-01-SS-157 0in - 6in: 47 mg/kg
C-XR-HF-01-SS-103 0in - 6in: 630 mg/kg C-XR-HF-01-SB1-103 6in - 12in: 159 mg/kg
C-XR-HF-01-SS-601 0in - 6in: 78 mg/kg
C-XR-HF-01-SS-113 0in - 6in: 97 mg/kg
C-XR-HF-01-SS-401 0in - 6in: 38 mg/kg
C-XR-HF-01-SS-602 0in - 6in: 22 mg/kg
C-XR-HF-01-SS-155 0in - 6in: 29 mg/kg
C-XR-HF-01-SS-702 0in - 6in: 30 mg/kg
C-XR-HF-01-SS-701 0in - 6in: 199 mg/kg
C-XR-HF-01-SS-151 0in - 6in: 294 mg/kg
C-XR-HF-01-SS-152 0in - 6in: 49 mg/kg
C-XR-HF-01-SS-156 0in - 6in: 47 mg/kg
411400
411500
411600
4774600
4774500
4774400
0 50 100 150 200 250 Feet
0 25 50 75 Meters
N
SKY RESEARCH
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
Pb < 261 mg/kg
Pb >= 261 mg/kg
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Small Arms Range and Shooting-In Buttress (SR001)
Syracuse Hancock International Airport
Firing-In Buttress (SR002)
Revised By Last Modified | Haagenson 02/05/2011 | Checked By | K. Lofgren 02/05/2011 | Approved By | I. Roberts 02/05/2011

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5.2.8 Natural and Cultural Resources

Per the CSE Phase I Report, there are no archaeological or cultural sites or federally listed threatened or endangered species, present at any of the MRAs (USACE 2009).

There are two animal species (reptiles) listed by the state of New York as endangered (Bog Turtle and Eastern Massasauga Rattlesnake) and one animal species (Black Tern) that is protected by the state. Six plant species within four miles of Syracuse are listed by the state as rare, vulnerable, or threatened, according to the New York State Department of Environmental Conservation Wildlife Resources Center. The six plant species are the Weak Stellate Sedge, Large Twayblade, Southern Twayblade, Pod Grass, Calypso, and Marsh Valerian. It is unknown if any of the species are present at Hancock Field. No threatened or endangered species have been observed at any of the MRAs.

5.2.9 Identification of Potential Receptors

The current land use for the MRAs on Hancock Field ANGB is not projected to change. However, unforeseen future land use designations for the MRAs at Hancock Field ANGB may conceivably include residential, commercial, and light industrial.

Thus, receptors at Hancock Field ANGB include authorized installation personnel (i.e., base maintenance workers and construction workers and residents), authorized contractors and visitors (i.e., workers and recreational users) and trespassers, as well as ecological receptors:

- Maintenance workers include current and future authorized base personnel who have access to this property, as well as other types of workers who will not typically be exposed to subsurface soil and groundwater.
- Construction workers include future intrusive workers who may work at MRAs to transform the property for its next intended use, as well as other types of workers who may also be exposed to groundwater and subsurface soil.
- Authorized recreational users include people who currently, or may in the future, use or move across the Hancock Field ANGB MRAs during recreational activities (e.g., joggers, golfers, etc.).
- Residents include people currently living in base housing or future residents if additional housing is developed on this property in the future.
- Trespassers include people who currently, or may in the future, use or move across the Hancock Field ANGB MRAs during unauthorized recreational activities (e.g., hunting, fishing).

Ecological receptors include all current and future animal and plant life, which may be exposed to the soil or water in any of the MRAs.

5.3 Firing-In Buttress (SR002)

5.3.1 Site Description

The Firing-In Buttress (SR002) is located in the eastern portion of Tract III, south of the northwest-southeast runway. The area contains dense vegetation and a small creek on the western side. The area measures 1212 ft by 305 ft with a perimeter of 2741 ft. The coordinates of the area are 43.1039947948 degrees latitude, -76.0921445307 degrees longitude. Soils in the area include Ontario loam. Average depth to groundwater is approximately 3.0 ft.

5.3.2 History of Munitions and Explosives of Concern Activities

The Firing-In Buttress (SR002) has been inactive since at least 1976. Its intended use was as a backstop and safety berm for jammed hot rounds. The Firing-In Buttress (SR002) was also used for boresight alignment and test firing for F-86 aircraft. Ammunition used was up to .50-caliber and 20-mm cannon rounds. This structure is thought to have been used only on rare occasions.

After demobilization Colonel Harvey VanWie was contacted about past use of the Firing-In Buttress. He indicated that the Firing-in Buttress was used to live fire guns of the F-86 and was not used to live fire or bore sight the A-37, A-10, or F-16s. He had no direct knowledge of the firing of the 3.5 heat rocket but believes it would have been from a single event and the Firing-in Buttress was not used as an explosive site for any other munitions.

5.3.3 Land Use

The area is vacant and has no current use. Besides the revetment structure, the area predominantly consists of an overgrown field with heavy shrubs and a few trees.

5.3.4 Access Controls

This site is located within Hancock Field ANGB and as such is behind the perimeter fence for the installation and public access is restricted. Additionally, a secondary fence with barbed wire surrounds the site. Portions of the site are also monitored by surveillance cameras. There is no public access to this area.

5.3.5 Restrictions

Because of the access restrictions on Hancock Field ANGB and the secondary fencing surrounding this site, there is no public access to this site.

5.3.6 Receptors

5.3.6.1 Nearby Population

Hancock field is located at the Syracuse Hancock International Airport. It is located approximately five miles north of the City of Syracuse, in Onondaga County. According to the U.S Census, there are approximately 579 persons per square mile in Onondaga County (U.S. Census, 2010).

5.3.6.2 Buildings near/within MRA

The Firing-in Buttress structure is intact but there are no other buildings in the MRA. This area is located in an undeveloped area of Hancock Field ANGB. Within a two mile radius of this MRA there are over 26 inhabited buildings, including educational facility, church, hospital, commercial building, and parks.

5.3.7 Field Investigation Results

5.3.7.1 Visual Surveys Results

Visual survey transects were completed at the MRA (**Figure 5-3**). Various areas of the MRA were not surveyed due to dense vegetation. Unsurveyable areas include heavily wooded areas immediately north and northwest of the revetment structure, and areas west of the creek. The western most portion of the Firing-In Buttress (SR002) is covered with pavement from an existing parking lot and a building, which is fenced off to the rest of the MRA.

Upon arrival of the visual survey team, all of the Firing-In Buttress (SR002) was overgrown with thick vegetation. While on site, the majority of the MRA was mowed with a Brush Hog by SSgt. James Marasia.

A small creek runs through the MRA from north to south. Visual survey transects were walked west of the creek, however, ground visibility was limited near the creek despite mowing. Visual survey teams found blank 5.56mm casings and one plastic 5.56mm magazine. Two plastic pop-up target silhouettes that did exhibit signs of small arms use were observed near the parking lot.

East of this creek, ground visibility improved towards the firing-in buttress structure. Directly in front of the revetment, where the Brush Hog had inadvertently turned up portions of the soil, visual survey teams observed one spacer from a 3.5 inch rocket. 0.50 caliber projectiles, 0.50 caliber steel cores and 20mm target practice (TP) debris were also found in samples taken from the center of the revetment.

The main findings at the Firing-In Buttress (SR002) were:

- Blank 5.56 casings.
- Plastic small arms 5.56mm magazine.
- 0.50 caliber steel cores.
- 20mm TP debris.
- 3.5 inch rocket spacer.

Photos of items observed at the Firing-In Buttress (SR002) during CSE Phase II visual surveys are presented in **Appendix D**.

5.3.7.2 Soil Sampling Results

During the visual survey there were no items observed that would constitute a significant release of MC from MEC items, therefore MC sampling associated with MEC items was not performed at this MRA. No MC sampling for explosives was conducted.

MC sampling for lead was conducted at this MRA. XRF sampling was performed for possible lead contamination related to small arms use. XRF samples and the associated correlation samples were collected from this MRA and discussed below.

5.3.7.2.1 On-Site X-Ray Fluorescence Sampling and Analysis

The SKY field team collected 26 soil samples at the Firing-In Buttress (SR002) for on-site XRF analysis for lead. Lead results ranged from < LOD to 585 mg/kg. Two subsurface soil samples, CX-XR-HF-01-SB1-209 and CX-XR-HF-01-SB2-209 collected within the revetment structure exceeded the 400 mg/kg action level. Sample CX-XR-HF-01-SS-209, the surface soil sample for the two aforementioned samples, did not exceed the action level. However, the observed value was near the action level and based on typical historical use of firing-in buttresses (aircraft fired into the center of the structure) additional subsurface lead samples were collected.

Delineation samples were collected within and directly outside the structure. Samples exceeding the 400 mg/kg action level were limited to soil inside and at the center of the revetment structure. Sample locations and results are presented in **Figure 5-4**. The XRF results for lead are presented in **Table 5-3**. Small arms debris was observed in two soil samples. A summary of these items is presented in **Section 5.3.7.1** and **Appendix D**. Lead contamination and munitions response site designations are discussed in **Section 13.0**. The results of the HHRA are discussed in **Section 9.5** and the results of the SLERA are discussed in **Section 10.0**.

5.3.7.2.2 Off-Site Laboratory Lead Analysis

Two correlation samples were selected at this MRA for off-site lead analysis, discussed in **Section 5.4**. Sample results are presented in **Figure 5-4**.

The laboratory correlation (see **Section 5.4** for details) resulted in a correlation coefficient (r) well below the acceptable range. Sample C-XR-HF-01-SS-109 was removed from the correlation analysis due to the likelihood of lead debris in the sample causing the large discrepancy in field and laboratory results. The RPD calculated from the duplicate results was high, which also indicates a lack of sample homogeneity. Because of these results, the action level was lowered from 400 mg/kg to 261 mg/kg, which is the field measured lead value for sample C-XR-HF-01-SS-109. Three of the 26 samples exceeded this modified action level.

5.3.8 Natural and Cultural Resources

Per the CSE Phase I Report, there are no archaeological or cultural sites, or threatened or endangered species, present at any of the MRAs (USACE, 2009).

5.3.9 Identification of Potential Receptors

Potential receptors for Hancock Field ANGB are described in **Section 10.3** and are similar to those described in **Section 5.2.9**.

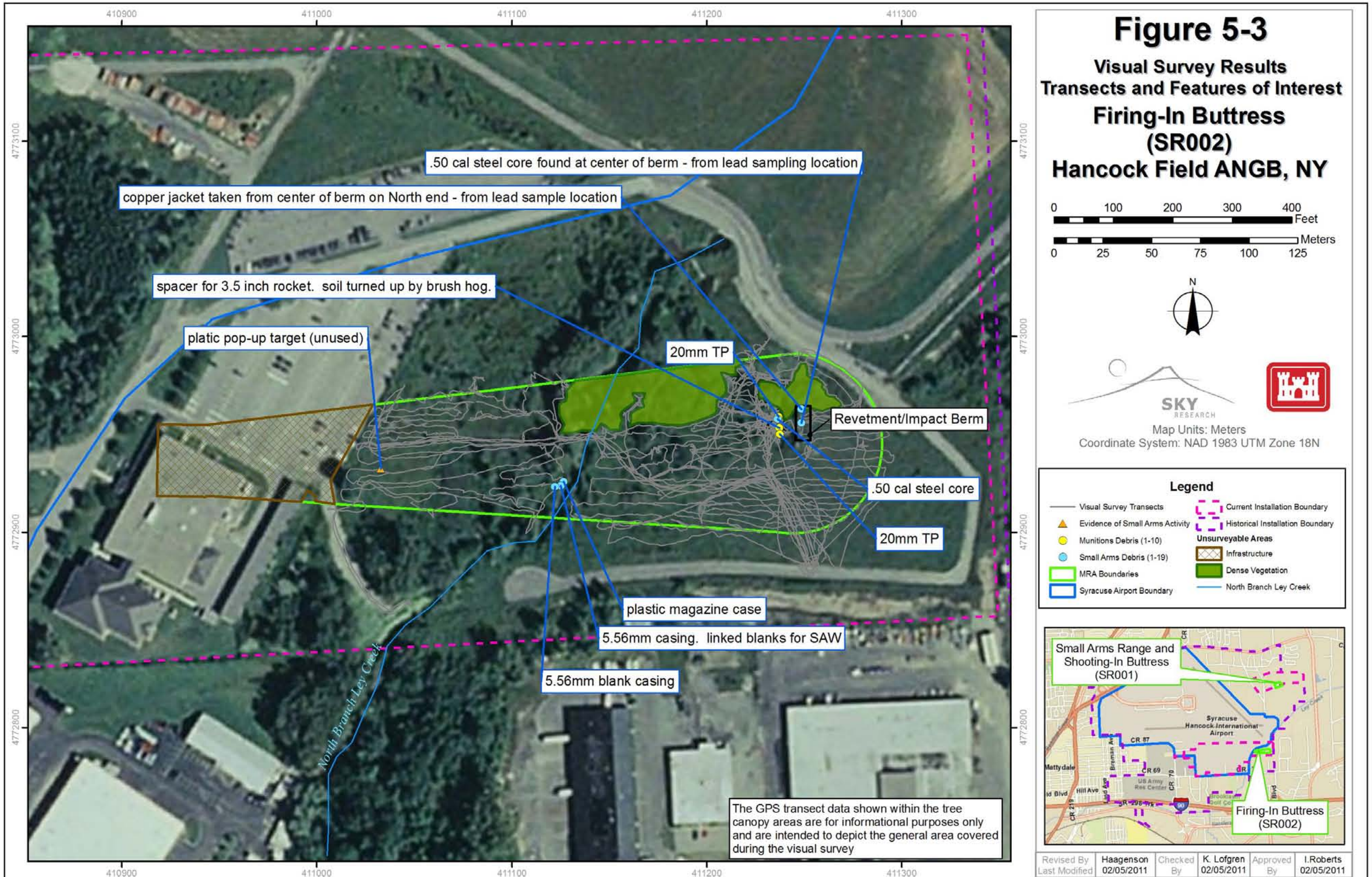
Figure 5-3
Visual Survey Results
Transects and Features of Interest
Firing-In Buttress
(SR002)
Hancock Field ANGB, NY
.50 cal steel core found at center of berm - from lead sampling location
copper jacket taken from center of berm on North end - from lead sample location
spacer for 3.5 inch rocket. soil turned up by brush hog.
platic pop-up target (unused)
20mm TP
Revetment/Impact Berm
.50 cal steel core
20mm TP
plastic magazine case
5.56mm casing. linked blanks for SAW
5.56mm blank casing
North Branch Ley Creek
The GPS transect data shown within the tree canopy areas are for informational purposes only and are intended to depict the general area covered during the visual survey
Feet
Meters
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
Visual Survey Transects
Evidence of Small Arms Activity
Munitions Debris (1-10)
Small Arms Debris (1-19)
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Unsurveyable Areas
Infrastructure
Dense Vegetation
North Branch Ley Creek
Small Arms Range and Shooting-In Buttress (SR001)
Firing-In Buttress (SR002)
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Haagenson 02/05/2011
Checked By
K. Lofgren 02/05/2011
Approved By
I.Roberts 02/05/2011

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Table 5-3 XRF Sampling Results, Firing-In Buttress (SR002)

Sample ID	Analysis Date /Time	Depth	Small Arms Debris	Final Pb, mg/kg	%RSD
C-XR-HF-02-SS-201[A]	9/13/2010 10:16	0 - 6 inches	None	103	8
C-XR-HF-02-SS-202	9/11/2010 15:44	0 - 6 inches	None	< LOD	NA
C-XR-HF-02-SS-203	9/11/2010 10:06	0 - 6 inches	None	16	NA
C-XR-HF-02-SS-204	9/13/2010 11:09	0 - 6 inches	None	24	NA
C-XR-HF-02-SS-205	9/13/2010 10:52	0 - 6 inches	None	23	NA
C-XR-HF-02-SS-206	9/13/2010 11:33	0 - 6 inches	None	19	NA
C-XR-HF-02-SS-207[A]	9/11/2010 15:50	0 - 6 inches	None	30	NA
C-XR-HF-02-SS-208	9/13/2010 11:51	0 - 6 inches	None	18	NA
C-XR-HF-02-SS-209[A]	**9/11/2010 9:56**	**0 - 6 inches**	**None**	**368**	**18**
C-XR-HF-02-SB1-209[B]	**9/14/2010 15:39**	**6 - 12 inches**	**20mm debris**	**585**	**12**
C-XR-HF-02-SB2-209[B]	**9/14/2010 16:11**	**12 - 18 inches**	**lead debris and 50 cal core**	**431**	**16**
C-XR-HF-02-SB3-209[B]	9/14/2010 16:51	18 - 24 inches	None	195	10
C-XR-HF-02-SS-251	9/13/2010 10:47	0 - 6 inches	None	15	NA
C-XR-HF-02-SS-252	9/13/2010 12:39	0 - 6 inches	None	17	NA
C-XR-HF-02-SS-253	9/13/2010 11:56	0 - 6 inches	None	17	NA
C-XR-HF-02-SS-254	9/13/2010 11:46	0 - 6 inches	None	24	NA
C-XR-HF-02-SS-255	9/13/2010 11:29	0 - 6 inches	None	21	NA
C-XR-HF-02-SS-256	9/13/2010 11:15	0 - 6 inches	None	18	NA
C-XR-HF-02-SS-257	9/11/2010 16:26	0 - 6 inches	None	< LOD	NA
C-XR-HF-02-SS-351	9/13/2010 11:03	0 - 6 inches	None	14	NA
C-XR-HF-02-SS-352	9/13/2010 12:34	0 - 6 inches	None	22	NA
C-XR-HF-02-SS-353	9/13/2010 10:26	0 - 6 inches	None	27	NA
C-XR-HF-02-SS-502	9/15/2010 12:11	0 - 6 inches	None	14	NA
C-XR-HF-02-SS-503[B]	9/14/2010 15:19	0 - 6 inches	None	24	NA
C-XR-HF-02-SS-504[B]	9/14/2010 15:25	0 - 6 inches	None	31	NA
C-XR-HF-02-SS-519	9/15/2010 14:39	0 - 6 inches	None	13	NA

Notes:
Sample ID Modifiers: A = Target sample, B = Step-out sample, Remaining samples are spatial-random.
< LOD= below the limit of detection. The limit of detection is approximately 12 mg/kg based on the lowest observed value at Hancock Field ANGB.
mg/kg= Milligrams per kilogram.
RSD = Relative Standard Deviation.
NA = Not Applicable. Percent RSD not calculated when sample is less than 50 mg/kg or greater than1000 mg/kg. Results that are less than 50 mg/kg and greater than 1,000 mg/kg are an order of magnitude lower and higher than the action level therefore the 20% RSD criteria is not as essential for determining action level exceedance.

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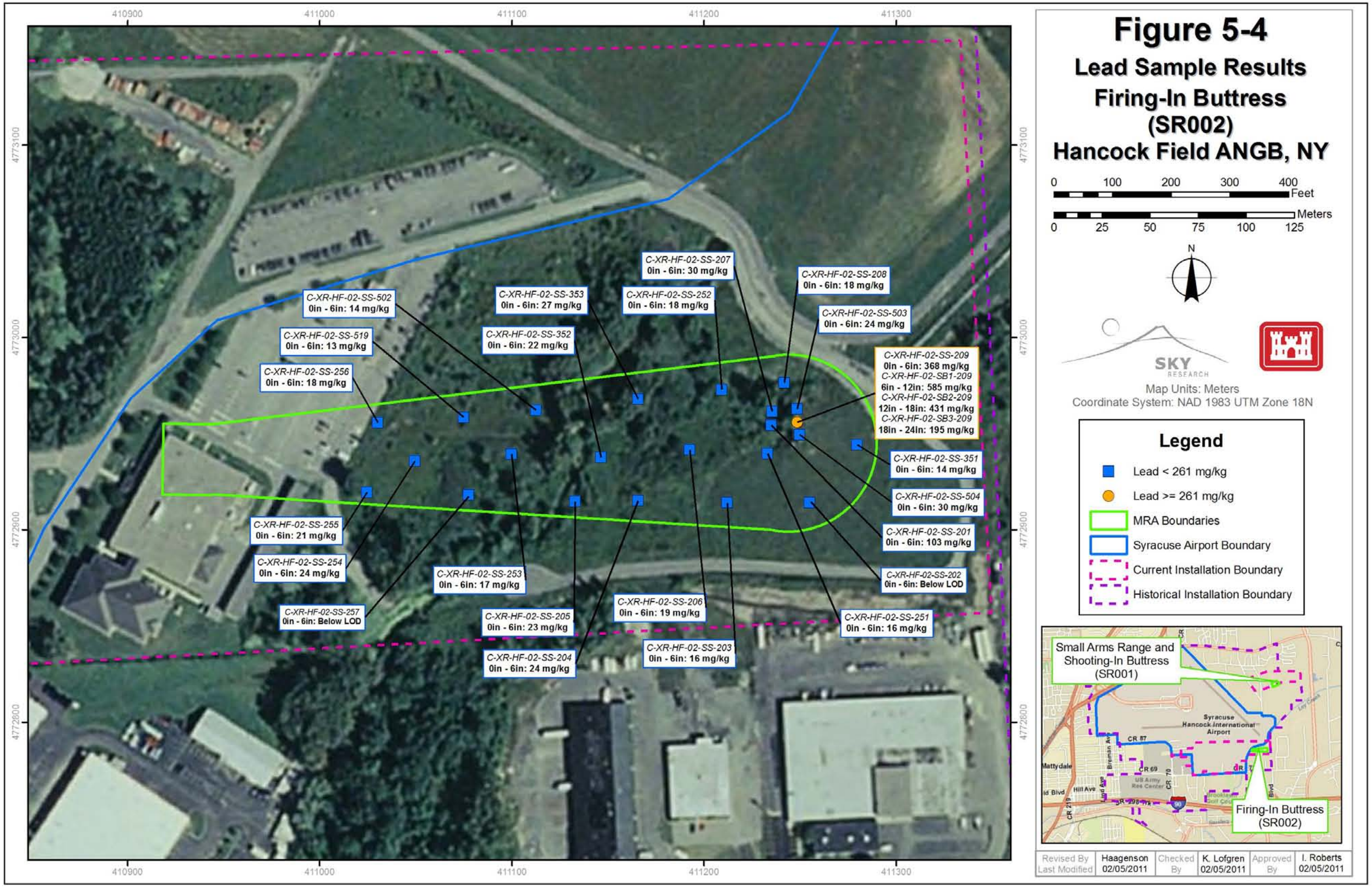
Figure 5-4
Lead Sample Results
Firing-In Buttress
(SR002)
Hancock Field ANGB, NY
0 100 200 300 400 Feet
0 25 50 75 100 125 Meters
N
SKY RESEARCH
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
Lead < 261 mg/kg
Lead >= 261 mg/kg
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Small Arms Range and Shooting-In Buttress (SR001)
Firing-In Buttress (SR002)
Syracuse Hancock International Airport
C-XR-HF-02-SS-207 0in - 6in: 30 mg/kg
C-XR-HF-02-SS-208 0in - 6in: 18 mg/kg
C-XR-HF-02-SS-502 0in - 6in: 14 mg/kg
C-XR-HF-02-SS-353 0in - 6in: 27 mg/kg
C-XR-HF-02-SS-252 0in - 6in: 18 mg/kg
C-XR-HF-02-SS-503 0in - 6in: 24 mg/kg
C-XR-HF-02-SS-519 0in - 6in: 13 mg/kg
C-XR-HF-02-SS-352 0in - 6in: 22 mg/kg
C-XR-HF-02-SS-209 0in - 6in: 368 mg/kg
C-XR-HF-02-SB1-209 6in - 12in: 585 mg/kg
C-XR-HF-02-SB2-209 12in - 18in: 431 mg/kg
C-XR-HF-02-SB3-209 18in - 24in: 195 mg/kg
C-XR-HF-02-SS-256 0in - 6in: 18 mg/kg
C-XR-HF-02-SS-351 0in - 6in: 14 mg/kg
C-XR-HF-02-SS-504 0in - 6in: 30 mg/kg
C-XR-HF-02-SS-201 0in - 6in: 103 mg/kg
C-XR-HF-02-SS-255 0in - 6in: 21 mg/kg
C-XR-HF-02-SS-254 0in - 6in: 24 mg/kg
C-XR-HF-02-SS-253 0in - 6in: 17 mg/kg
C-XR-HF-02-SS-202 0in - 6in: Below LOD
C-XR-HF-02-SS-206 0in - 6in: 19 mg/kg
C-XR-HF-02-SS-257 0in - 6in: Below LOD
C-XR-HF-02-SS-205 0in - 6in: 23 mg/kg
C-XR-HF-02-SS-251 0in - 6in: 16 mg/kg
C-XR-HF-02-SS-203 0in - 6in: 16 mg/kg
C-XR-HF-02-SS-204 0in - 6in: 24 mg/kg
410900
411000
411100
411200
411300
4773100
4773000
4772900
4772800
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K. Lofgren 02/05/2011
Approved By
I. Roberts 02/05/2011

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5.4 X-Ray Fluorescence Correlation Samples

At the conclusion of the XRF sampling, 12 correlation samples were selected from the two MRAs and sent for off-site analysis to evaluate whether the XRF sampling met the method requirements for definitive data and the DQOs for the project. Correlation samples were selected based on the results of the XRF and the QC data obtained during analysis. Correlation samples for off-site laboratory analysis bracketed the decision point (i.e., 400 mg/kg) and covered a range of concentrations from 25 mg/kg to 585 mg/kg. Samples bracketing the screening levels were given preference to samples that exceeded the action level criteria by magnitudes.

The correlation samples were used to verify the accuracy of the XRF data. The XRF data was plotted against the lab data in a least-squares linear regression and a correlation coefficient (r) was calculated. Per USEPA SW-846 Method 6200, the XRF field data are considered definitive if the correlation coefficient (r) from the linear regression analysis is equal to or greater than 0.9.

The results of the linear regression analysis including all 12 correlation samples yielded a correlation coefficient of 0.15, not meeting the required 0.9 for the definitive data. Sample C-XR-HF-01-SS-109 was an outlier during the linear regression analysis. Results of the XRF, off-site lab analysis and photo documentation of the outlier soil sample was inspected to determine a potential source of error. The outlier sample was collected from a location containing small arms and site debris. Lead debris (such as fragments or flakes) not removed from the sample was likely the cause of the discrepancy between the XRF and lab data. The outlier sample was removed from the linear regression analysis and the correlation coefficient (r) was recomputed resulting in a value of 0.96, the correlation plot is presented in **Figure 5-5**.

The XRF and lab values of the outlier sample are listed in **Table 5-4**. The observed value of the outlier sample is 261 mg/kg. As a conservative approach to ensure the horizontal and vertical extents of lead exceeding the action level was fully characterized the delineation criteria was lowered from 400 mg/kg to 261 mg/kg.

All sample handling, preparation and shipment was performed in accordance with the UFP-QAPP and as described in **Section 4.6**. **Table 5-4** lists the samples selected for correlation analysis and their corresponding XRF and lab analysis results.

One field duplicate, C-XR-HF-02-SB1-1001, was submitted with the lead correlation samples. This sample is a blind duplicate of sample C-XR-HF-02-SB1-209. Blind duplicates have unique IDs and are not identified as a field duplicate on the COC form. The lead result of the sample and duplicate was evaluated by calculating the RPD. The RPD for the correlation sample and its duplicate is 54%. The RPD exceedance indicates a lack of sample homogeneity and the data may not be precise. However, this exceedance is slight and because the results are an order of magnitude above samples already exceeding the action level, these data are still usable for making decisions regarding the site.

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Figure 5-5 XRF Correlation Results

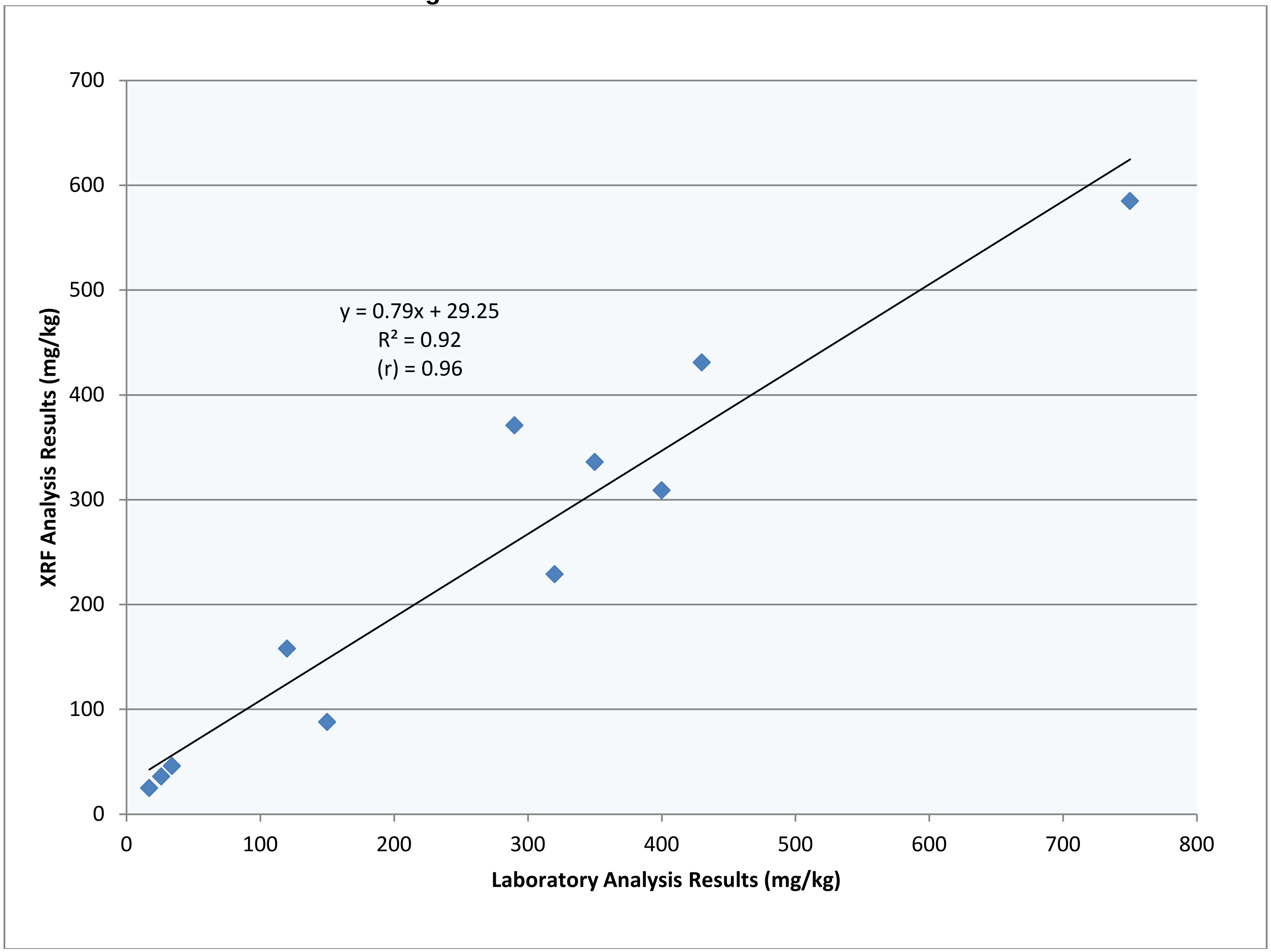

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Table 5-4 Lead XRF Correlation Analysis

Sample ID	Lab Results (mg/kg)	XRF Results (mg/kg)	XRF % RSD
C-XR-HF-01-SS-301	17	25	6
C-XR-HF-01-SS-306	26	36	6
C-XR-HF-01-SS-158	34	46	6
C-XR-HF-01-SB1-101	150	88	6
C-XR-HF-01-SB1-103	120	158	2
C-XR-HF-01-SB1-009	320	229	8
C-XR-HF-01-SS-109*	6300	261	4
C-XR-HF-01-SS-114	400	309	13
C-XR-HF-01-SS-009	350	336	7
C-XR-HF-01-SB1-105	290	371	12
C-XR-HF-02-SB2-209	430	431	16
C-XR-HF-02-SB1-209	750	585	12

Notes: mg/kg = milligram per kilogram.
XRF = X-Ray fluorescence.
***** Sample removed from final correlation analysis.

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6.0 Evaluation of Known/Suspected Munitions and Explosives of Concern

6.1 Munitions and Explosives of Concern Technical Data

No munitions items meeting the definition of MEC were encountered while surveying the Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002) MRAs during the CSE Phase II field activities. MEC distinguishes specific categories of military munitions that may pose unique explosives safety risks and includes: Unexploded Ordnance (UXO), Discarded Military Munitions (DMM), or Munitions Constituents (MC) present in high enough concentrations to pose an explosive hazard (e.g., TNT, RDX). Only small arms and munitions debris were observed during the visual survey at the Hancock Field ANGB.

There is no known or suspected MEC present at the two Hancock Field ANGB MRAs; therefore, there are no known primary sources and release mechanisms.

Although there was a 3.5 inch Heat Rocket discovered during the Phase I and a spacer discovered during the Phase II investigation there is a high probability, based upon the historic use of the Firing-In Buttress (SR002), that these two items were the result of an isolated incident. Col Harvey VanWie indicated that the Firing-in Buttress was not intended for use with explosive munitions and although he didn't have specific knowledge of the 3.5 inch Heat Rocket firing but believed the incident to be an isolated occurrence.

6.2 Munitions and Explosives of Concern Secondary Sources

There is no known or suspected MEC present at the two Hancock Field ANGB MRAs; therefore, there are no known MEC locations or secondary sources.

6.3 Munitions and Explosives of Concern Penetration Estimates

There is no known or suspected MEC present and, therefore, MEC penetration estimates do not apply.

6.4 Special Consideration Munitions and Explosives of Concern

Based on the results of the HRR, anecdotal information collection, and the visual survey, there are no known or suspected special consideration MEC at Hancock Field ANGB.

6.5 Known/Suspected Munitions Constituents

Based on the results of the HRR, anecdotal information collection, and the visual survey, there is potential MC in surface soil associated with activities conducted at the Small Arms Range and Shooting-In Buttress (SR001) and the Firing-In Buttress (SR002). Suspected MCs included lead. Analytical results are discussed in **Sections 5.2.7.2** and **5.3.7.2** and in the screening level human health and ecological risk assessments in **Section 9.0** and **Section 10.0**.

Details regarding the types of MEC and munitions used at Hancock Field ANGB are presented in **Table 6-1**. These tables list the size/type, nomenclature, net explosive weight (NEW), and MC associated with each of the items.

Table 6-1 Composition of Munitions Used at Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002)

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
Caliber .30, Ball	M2	58.0 gr	[Propellant (WC 852)]: Nitroglycerin (81.18%), Dibutylphthalate (5.5%), Diphenylamine (1.13%), Calcium Carbonate (1%), Potassium Nitrate (0.8%), Sodium Sulfate (0.5%), Graphite (0.4%)	MIDAS*	N/A
		0.60 gr	[Primer (FA 956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), PETN (5%), Tetracene (4%)		
		52.0 gr	[Jacket]: Brass- (Copper 90%, Zinc 10%)		
		100.0 gr	[Slug] : Lead Antimony Alloy – (Lead 99%, Antimony 1%		
Caliber .30, Carbine, Ball	M1	13.0 gr	[Propellant (HPC 5)]: Nitrocellulose (79.68%), Nitroglycerin (15%), Ethyl Centralite (4%), Diphenylamine (0.93%), Graphite (0.4%)	MIDAS	N/A
		0.350 gr	[Primer (FA 956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), PETN (5%), Tetracene (4%)		
		25.0 gr	[Jacket](Copper Alloy Clad Steel): Iron (79.546%), Copper (18%), Zinc (1.98 %), Manganese (0.2%), Carbon (0.104%), Phosphorus (0.056%), Silicon (0.056%), Sulfur (0.048%), Lead (0.01%)		
		83.0 gr	[Slug] (Lead Antimony Alloy); Lead (99%), Antimony (1%)		
Caliber .30, AP	M2	55.0 gr	[Propellant (WC 852)]: Nitroglycerin (81.18%), Dibutylphthalate (5.5%), Diphenylamine (1.13%), Calcium Carbonate (1%), Potassium Nitrate (0.8%), Sodium Sulfate (0.5%), Graphite (0.4%)	MIDAS	N/A
		0.60 gr	[Primer (FA 956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), PETN (5%), Tetracene (4%)		
		65.5 gr	[Jacket] (Brass): Copper (90%), Zinc (10 %)		

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
		12.0 gr	[Filler Point] (Lead Antimony Alloy); Lead (99%), Antimony (1%)		
		81.0 gr	[Core](Steel): Iron (97.89%), Manganese (0.75%), Carbon (0.7%), Copper (0.35%), Silicon (0.22%), Sulfur (.05%), Phosphorus (0.04%)		
		7.70 gr	[Filler Base](Brass): Copper (90%), Zinc (10%)		
Caliber .30, Trace	M25	50.0 gr	[Propellant (WC 852)]: Nitroglycerin (81.18%), Dibutylphthalate (5.5%), Diphenylamine (1.13%), Calcium Carbonate (1%), Potassium Nitrate (0.8%), Sodium Sulfate (0.5%), Graphite (0.4%)	MIDAS	N\A
		0.60 gr	[Primer (FA 956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), PETN (5%), Tetracene (4%)		
		1.0 gr	[IGN (I-136)]: Strontium Peroxide (90%), Calcium Resinate (10%)		
		6.0 gr	[TR (R-321)]: Strontium Nitrate (52%), Magnesium Pwdr (26%), Polyvinyl Chloride (16%), Chlorinated Rubber (6%)		
		68.0 gr	[Jacket](Copper Alloy Clad Steel): Iron (79.546%), Copper (18%), Zinc (1.98%), Manganese (0.2%), Carbon (0.104%), Phosphorus (0.056%), Silicon (0.056%), Sulfur (0.048%), Lead (0.01%)		
		68.0 gr	[Filler Point](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
Caliber .50, Ball	M2	235.0 gr	[Propellant (WC 860)]: Nitrocellulose (78.67%), Nitroglycerin (9.5%), Dibutylphthalate (8%), Diphenylamine (1.13%), Calcium Carbonate (1%), Potassium Nitrate (0.8%), Sodium Sulfate (0.5%), Graphite (0.4%)	MIDAS	N\A
		2.260 gr	[Primer (Mix 5061W)]: Lead Styphnate (38%), Barium Nitrate (43%), Antimony Sulfide (9%), -Calcium Silicide (8%), Tetracene (2%)		
		253.0 gr	[Jacket](Gilding Metal): Copper (95%), Zinc (5%)		

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
		400.0 gr	[Core](Steel): Iron (99.36%), Manganese (0.45%), Carbon (0.11%), Sulfur (0.05%), Phosphorus (0.04%)		
		56.0 gr	[Filler Point](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
Caliber .50, Ball, AP	M2	235.0 gr	[Propellant (IMR 5010)]: Nitrocellulose (89.92%), Dinitrotoluene (8.25%), Diphenylamine (0.88%), Potassium Sulfate (0.55%), Graphite (0.4%)		
		2.70 gr	[Primer (Mix K75)]: Barium Nitrate (40%), Lead Styphnate (39%), Antimony Sulfide (11%), Nitrocellulose (7%), Tetracene (2.5%), Prussian Blue Dye (0.4%), Gum Tragacanth (0.05%), Gum Arabic (0.05%)	MIDAS	N/A
		253.0 gr	[Jacket](Copper Alloy): Copper (90%), Zinc (9.9%), Lead (0.05%), Iron (0.05%)		
		50.0 gr	[Point Filler](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
		400.0 gr	[Core] (Steel){Manganese Molybdenum}: Iron (97.035%), Molybdenum (1%), Manganese (0.9%), Carbon (0.71%), Silicon (0.275%), Sulfur (0.04%), Phosphorus (0.04%)		
Caliber .50, Ball, Tracer	M17	225.0 gr	[Propellant (IMR 5010)]: Nitrocellulose (89.92%), Dinitrotoluene (8.25%), Diphenylamine (0.88%), Potassium Sulfate (0.55%), Graphite (0.4%)	MIDAS	N/A
		2.260 gr	[Primer (Mix 5061W)]: Lead Styphnate (38%), Barium Nitrate (43%), Antimony Sulfide (9%), Calcium Silicide (8%), Tetracene (2%)		
		0.24280 gr	[IGN (I-280*2)]: Strontium Peroxide (76.5%), Magnesium Pwdr (15%), Calcium Resinate (8.5%)		
		0.85710 gr	[TR (256*5)]: Strontium Nitrate (33%), Strontium Peroxide (26.7%), Magnesium Pwdr (20.7%), Calcium Resinate (6.7%), Polyvinyl Chloride (6%), Strontium Oxalate (5%). Calcium Resinate (1.6%)		
		253.0 gr	[Jacket](Gilding Metal): Copper (95%), Zinc (5%)		

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
		400.0 gr	[Core](Steel): Iron (99.36%), Manganese (0.45%), Carbon (0.11%), Sulfur (0.05%), Phosphorus (0.04%)		
		56.0 gr	[Filler Point](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
Caliber .38, Spec Ball	M41	4.80 gr	[Propellant (SR7325)]: Nitrocellulose (96.725%), Dinitrotoluene (2%), Diphenylamine (0.875%), Graphite (0.4%)	MIDAS	N/A
		0.420 gr	[Primer (MIX #864)]: Lead Styphnate (40%), Barium Nitrate (30%), Antimony Sulfide (16%), Tetracene (5%), Aluminum Pwdr (5%), PETN (4%)		
		109.0 gr	[Slug](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
		23.0 gr	[Jacket](Copper Alloy): Copper (90%), Zinc (9.9%), Lead (0.05%), Iron (0.05%)		
Caliber .45, Ball	M1911	5.0 gr	[Propellant (SR7970)]: Nitrocellulose (96.24%), Dinitrotoluene (2.5%), Diphenylamine (0.86%), Graphite (0.4%)	MIDAS	N/A
		0.460 gr	[Primer (MIX #295A)]: Lead Styphnate (37%), Barium Nitrate (29%), Antimony Sulfide (19%), Tetracene (5%), Aluminum Pwdr (5%), PETN (5%), Lead Thiocyanate (5%)		
		197.0 gr	[Slug](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
		34.0 gr	[Jacket](Copper Alloy Clad Steel) Iron (79.546%), Copper (18%), Zinc (1.98%), Manganese (0.2%), Carbon (0.104%), Phosphorus (0.056%), Silicon (0.056%), Sulfur (0.048%), Lead (0.01%)		
Caliber .22, Ball, Long Rifle	M24	2.50 gr	[Propellant (WRF 360)]: Nitrocellulose (66.68%), Nitroglycerin (15%), Diphenylamine (0.86%), Polyester Adipate (0.5%), Graphite (0.1%), Water (0.06%)	MIDAS	N/A
		0.340 gr	[Primer (MIX CAL.22 RF)]: Lead Styphnate (45%), Barium Nitrate (27%), GRND Glass (22%), Tetracene (5%), Gum (1%)		

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
		6.5 gr	[Jacket](Copper Alloy): Copper (90%), Zinc (9.9%), Lead (0.05%), Iron (0.05%)		
		34.0 gr	[Slug](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
9mm, Ball	M882	5.20 gr	[Propellant (HPC 33)]: Nitrocellulose (85.45%), Nitroglycerin (7%), Vinsol (4%), Potassium Nitrate (2%), Diphenylamine (0.95%), Graphite (0.6%)	MIDAS	N/A
		0.390 gr	[Primer (Wter 116-282A)]: Lead Styphnate (40%), PETN (6%), Barium Nitrate (33%), Strontium Sulfide (16%), Tetracene (5%)		
		23.0 gr	[Jacket](Copper Alloy): Copper (70%), Zinc (29.88%), Lead (0.07%), Iron (0.05%)		
		101.0 gr	[Slug](Lead Antimony Alloy): Lead (99%), Antimony (1%)		
Blank 5.56mm	M200	7.0 gr	[Propellant (HPC 13)]: Nitrocellulose (66.1%), Nitroglycerin (28.5%), Ethyl Centralite (4.25%), Potassium Sulfate (0.75%), Graphite (0.4%)	MIDAS	N/A
		0.390 gr	[Primer (FA-956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), Tetracene (4%), PETN (5%)		
Ball 5.56mm	M193	28.5 gr	[Propellant (WC844)]; Nitrocellulose (66.95%), Nitrogen (13.2%), Nitroglycerin (11.2%), Dibutyl Phthalate (6%), Diphenylamine (1.5%), Anhydrous Sodium Sul (0.5%), Graphite (0.4%)	MIDAS	N\A
		0.39 gr	[Primer (FA-956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), Tetracene (4%), PETN (5%)		
		17.5 gr	[Jacket Pointed (Copper Alloy)]: Copper (90.0%), Zinc (9.9%), Lead (0.05%), and Iron (0.05%)		
		38.50 gr	[Slug (Lead Antimony Alloy)]: Lead (99%), Antimony (1%)		

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
7.62mm, Ball	M59	46.0 gr	[Propellant (10534784-1)]: Nitrocellulose (83.35%), Nitroglycerin (9.5%), Dibutyl Phthalate (5%), Diphenylamine (1.25%), Sodium Sulfate (0.5%), Graphite (0.4%)	MIDAS	N/A
		0.60 gr	[Primer (FA-956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), Tetracene (4%), PETN (5%)		
		57.0 gr	[Jacket](Brass): Copper (90%), Zinc (10%)		
		55.0 gr	[Core](Steel): Iron (98.6%), Manganese (0.85%), Carbon (0.41%), Sulfur (0.11%), Phosphorus (0.04%)		
		24.0 gr	[Filler Point](Lead Antimony Alloy): Lead (99%), Antimony (1%).		
		14.5 gr	[Filler Base] (Lead Antimony Alloy): Lead (99%), Antimony (1%).		
7.62mm, Ball, Trace	M62	46.0 gr	[Propellant (WC 846)]: Nitrocellulose (82.97%), Nitroglycerin (9.5%), Dibutylphthalate (5.25%), Diphenylamine (1.13%), Calcium Carbonate (0.25%), Sodium Sulfate (0.5%), Graphite (0.4%)	MIDAS	N/A
		0.60 gr	[Primer (FA-956)]: Lead Styphnate (37%), Barium Nitrate (32%), Antimony Sulfide (15%), Aluminum Pwdr (7%), Tetracene (4%), PETN (5%)		
		1.0 gr	[IGN (I-280*1)]: Strontium Peroxide (76.5%), Magnesium Pwdr (15%), Calcium Resinate (8.5%)		
		6.50 gr	[TR (R-284)]: Strontium Nitrate (55%), Magnesium Pwdr (28%), Polyvinyl Chloride (17%)		
		60.0 gr	[Jacket](Copper Alloy Clad Steel) Iron (79.546%), Copper (18%), Zinc (1.98%), Manganese (0.2%), Carbon (0.104%), Phosphorus (0.056%), Silicon (0.056%), Sulfur (0.048%), Lead (0.01%)		
		72.0 gr	[Filler Point](Lead Antimony Alloy): Lead (99%), Antimony (1%).		

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
Rocket 3.5in HEAT	M28A2	1.88 lbs	[Head Loading Assembly](Charge Bursting): Comp B (RDX CL A), RDX (60%), TNT (39%), Wax (1%).	MIDAS	M404 A2 BD
		6442.0 gr	[Cone Head](Copper Alloy): Copper (99.9%), Oxygen (0.04%)		
		75.4 gr	[Pellet Booster](Tetryl Pellets): Tetryl (98%), Calcium Stearate (0.75%), Barium Stearate (0.75%), Graphite (0.5%)		
		1.62 gr	[Primer Mix] (Primer Mix NOL): Lead Styphnate (40%), Lead Azide (20%), Barium Nitrate (20%), Antimony Sulfide (15%), Tetrazine (5%).		
		3.86 gr	[Lead Azide]: Lead Azide (100%)		
		2.01 gr	[RDX]: RDX (100%)		
Rocket 3.5in Practice	M29A2	3.3 lbs	[Motor Loading Assembly](Chg Prop)(Propellant M7): Nitrocellulose (54.6%), Nitroglycerin (35.5%), Potassium Perchlorate (7.8%), Carbon Black (1.2%), Ethyl Centralite (0.9%)	MIDAS	N\A
		3.5 gm	[Expellant Charge](Black Powder CL 7): Potassium Nitrate (74%), Charcoal (15.6%), Sulfur (10.4%)		
		1.0 gr	[Flash Charge Comp]: Potassium Chlorate (40%), Lead Thiocyanate (32%), Charcoal (18%), Egyptian Lacquer (10%)		
Projectile 40mm Practice	M781	1.12 gm	[Windshield]:Plastic	MIDAS	N\A
		155 gm	[Body (Zinc Alloy)]: Zinc (95.708%), Aluminum (3.9%), Copper (0.25%), Iron (0.1%), Magnesium (0.03%), Lead (0.005%), Cadmium (0.004%), Tin (0.003%)		
Cartridge Case Assy (for use with M781 40mm Practice Grenade)	M212	21.5018 gm	[Cartridge Case(M212 Prac): Nylon	MIDAS	N\A
		340 mg	[Prop M9 Flake]: Nitrocellulose (57.2%), Nitroglycerin (39.84%), Potassium Nitrate (1.49%), Ethyl Centralite (0.75%), Graphite (0.4%)		
		.33 gr	[Primer Mix] (PA-101): Lead Styphnate (53%), Barium Nitrate (22%), Antimony Sulfide (10%), Aluminum (5%),		

U.S. Cartridge	Nomenclature	NEW (units)	Munitions Constituent(s)	MC Ref Pub(s)	Fuses
Non-Lethal Offensive Hand Grenade	GG04	7.977 gr	Pyrotechnic Charge System	TB 9-1330-211-14	M201 A1
Smoke Canister (General) HC	Unknown	Unknown	[White Smoke Mix (Hexachlorophene (HC)]: Zinc Oxide (46.47%), Hexachlorophene (44.53%), Aluminum Powder (9%)	MIDAS	UNKNOWN
			[Starter Mix]: Potassium Nitrate (35%), SI Powder (26%), Iron Oxide (22%), and Charcoal (4%)]		
20mm TP	M220 Elect	600	[Propellant (WC 872)]: Nitrocellulose (78.1%), Nitroglycerin (9.5%), Diphenylamine (1.13%), Graphite (0.4%), Dibutylphathalate (7.5%), Tin Dioxide (1.07%), Calcium carbonate (1%), Sodium sulfate (0.5%), Potassium nitrate (0.8%), Graphite (0.4%)	TM 43-0001-27 MIDAS	N/A
		2.63	[Primer Mix (FA-874)]: Barium Nitrate (44.25%), Lead Styphnate (40%), Calcium Silicide (13%)		
		1,430	[Projectile]: Aluminum (92.3%), Copper (5.5%), Iron (0.7%), Silicon (0.4%), Lead (0.4%), Bismuth (0.4%), Zinc (0.3%)		

References: Munitions Item Disposition Action System (MIDAS), Database, https://midas.dac.army.mil/, 2009 (U.S. Army, 2009)

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7.0 Evaluation of Hazardous Waste/Substances

7.1 Hazardous Waste Activities

No evidence of hazardous waste activities associated with the MRAs was identified during the CSE Phase II field activities.

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8.0 Conceptual Site Models

The preliminary CSM was developed in the CSE Phase II Final Work Plan (2010) to address MEC and/or MC environmental contamination at Hancock Field ANGB. The CSM is a description of the site and its environment based on existing knowledge. It describes contamination sources and possible receptors, and the interactions that link them. The CSM is used as a planning tool to integrate information from a variety of resources, to evaluate the information with respect to project objectives and data needs, and to evolve through an iterative process of further data collection or action. The information provided was refined through the CSE Phase II process. Based on the CSM developed to date for Hancock Field ANGB, data gaps were identified and the CSE Phase II field effort was designed to fill these data gaps. The preliminary CSM is revised in this section based upon the data collected in the CSE Phase II investigation.

8.1 Munitions and Explosives of Concern

The following evidence of MEC was found during the CSE Phase I and Phase II conducted at Hancock Field ANGB. During the CSE Phase I, one large-caliber round, identified as a 3.5-inch rocket (HEAT; M28A2) was found embedded in railroad ties forming the top of the revetment at the Firing-In Buttress (SR002).

During the CSE Phase II at SR002, survey teams observed MD consisting of one spacer from a 3.5-inch rocket (HEAT; M28A2) and 20mm TP debris in soil directly in front of the revetment where a Brush Hog being used to clear vegetation inadvertently turned up portions of the soil. MD consisting of .50 cal debris was also found while sampling in the Firing-In Buttress (SR002) revetment. Although 20mm TP projectiles (which contain no HE) were observed at the site, the Firing-In Buttress (SR002) was historically used as a boresight range. It is unlikely that 20mm HE was ever used at this site and would therefore not be present sub-surface.

During the CSE Phase II at the Small Arms Range and Shooting-In Buttress (SR001), MD consisting of 40mm practice grenade debris, smoke canister debris, lead projectiles, and non-lethal offensive grenade debris was found.

The historical use of the Firing-In Buttress (SR002) did not include rockets. It was assumed during the CSE Phase I and II that the rocket and rocket debris observed were probably the result of an isolated firing. In conversation with the USACE it was determined there was not enough evidence to warrant MC soil sampling at either SR001 or SR002. All items found at both MRAs during the CSE Phase II do not meet the definition of MEC.

8.1.1 Munitions and Explosives of Concern Exposure Pathway Analysis

No MEC items were observed in the Small Arms Range and Shooting-In Buttress (SR001) MRA during the CSE Phase II. All MEC exposure pathways are therefore considered incomplete.

During the CSE Phase II visual surveys of the Firing-In Buttress (SR002) only 20mm TP projectiles, which contain no HE, and .50 caliber projectiles were identified; therefore, all MEC exposure pathways are incomplete.

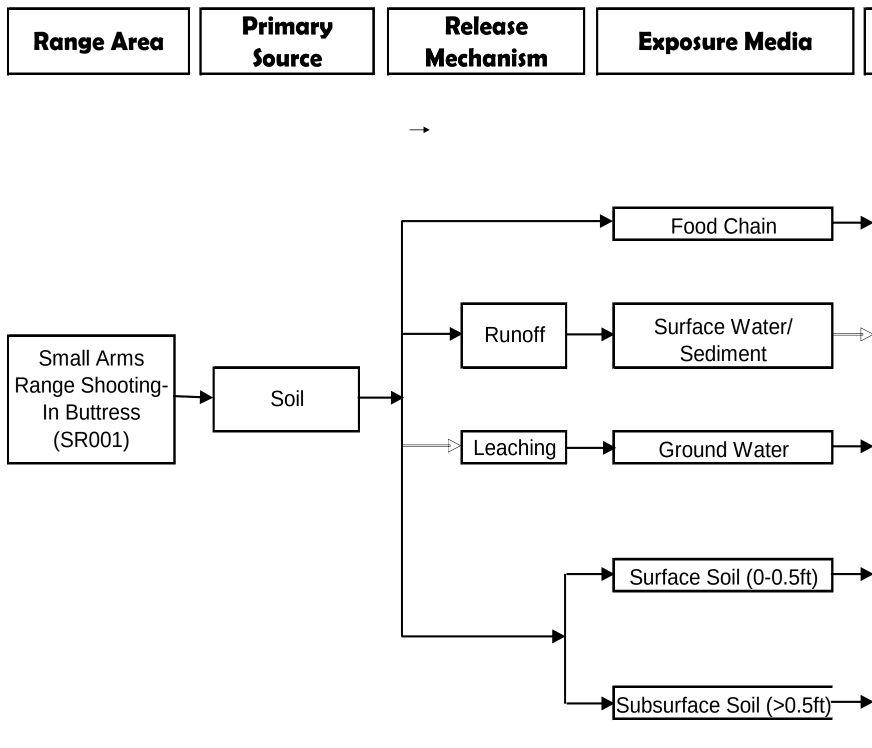
8.2 Munitions Constituents, Hazardous Substances, Pollutants, and Contaminants of Concern Conceptual Site Model

The CSMs for MC exposure at the Hancock Field ANGB MRAs are presented in **Figure 8-1** and **Figure 8-2**. The CSMs identify complete, potentially complete or incomplete pathways between MC sources and receptors at the MRAs. The potential for MC at the MRAs comes from the degradation of munitions debris in the surface or subsurface soils. Potential MC associated with munitions at the Hancock Field ANGB MRAs includes lead at Small Arms Range and Shooting-In Buttress (SR001) and at the Firing-In Buttress (SR002).

The fate and transport of MC can occur in all three environmental media: terrestrial, aquatic, and atmospheric. Terrestrial environments are comprised of soil and groundwater; aquatic environments include surface water, marsh, and sediment; and air is the only component of the atmospheric environment. In the terrestrial environment, if the contaminant is released to soil, the contaminant may volatilize, adhere to the soil by sorption, leach into the groundwater, or degrade due to chemical (abiotic) or biological (biotic) processes. If the contaminant is volatilized, the compound may be released to the atmosphere, or if volatilization occurs in the subsurface, the contaminated vapor may migrate and sorb to previously uncontaminated soil or dissolve in groundwater. Constituents that are dissolved in groundwater eventually may be transported to an aquatic environment.

Once a contaminant is released to the aquatic environment, it can either volatilize or remain in the aquatic environment. In the aquatic environment, contaminants may be dissolved in the surface water or sorbed to the sediment. Contaminants may move between dissolved and sorbed states depending on a variety of physical and chemical factors. In the atmospheric environment, contaminants may exist as vapors or as particulate matter. The transport of contaminants in the atmosphere relies mostly on wind currents, and continues until the contaminants are returned to the earth by wet or dry deposition. Degradation of organic compounds in the atmosphere can occur due to direct photolysis, reaction with other chemicals, or reaction with photochemically-generated hydroxyl radicals.

Figure 8-1 MC Exposure Pathway Analysis, Small Arms Range and Shooting-In Buttress (SR001)



Exposure Media	Exposure Routes	Authorized Personnel	Contractors	Trespassers and Visitors	Future Residents and Workers	Biota
Food Chain	Vegetation	○	○	○	○	●
	Domestic Animals	○	○	○	○	○
	Wildlife	○	○	○	○	●
Surface Water/ Sediment	Ingestion	○	○	○	○	○
	Dermal Contact	○	○	○	○	○
Ground Water	Ingestion/Root Uptake	⊙	⊙	○	⊙	⊙
	Dermal Contact	⊙	⊙	○	⊙	○
	Inhalation (Vapor)	○	○	○	○	○
Surface Soil (0-0.5ft)	Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (Dust)	●	●	●	●	●
Subsurface Soil (>0.5ft)	Ingestion	●	●	○	●	●
	Dermal Contact	●	●	○	●	●
	Inhalation (Dust)	●	●	○	●	●

Receptors

○ Incomplete Pathway
⊙ Potentially Complete Pathway
● Complete Pathway

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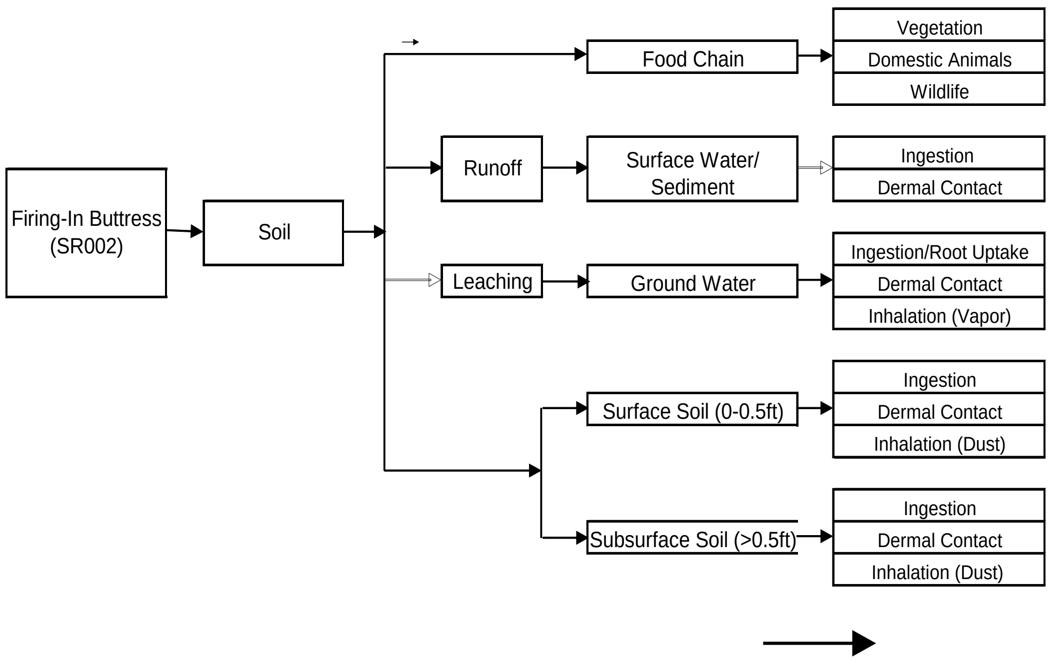
Figure 8-2 MC Exposure Pathway Analysis, Firing-In Buttress (SR002)



Medium	Exposure Route	Authorized Personnel	Contractors	Trespassers and Visitors	Future Residents and Workers	Biota
Food Chain	Vegetation	○	○	○	○	●
	Domestic Animals	○	○	○	○	○
	Wildlife	○	○	○	○	●
Surface Water/ Sediment	Ingestion	○	○	○	○	○
	Dermal Contact	○	○	○	○	○
Ground Water	Ingestion/Root Uptake	⊙	⊙	○	⊙	⊙
	Dermal Contact	⊙	⊙	○	⊙	○
	Inhalation (Vapor)	○	○	○	○	○
Surface Soil (0-0.5ft)	Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (Dust)	●	●	●	●	●
Subsurface Soil (>0.5ft)	Ingestion	●	●	○	●	●
	Dermal Contact	●	●	○	●	●
	Inhalation (Dust)	●	●	○	●	●

○ Incomplete Pathway
⊙ Potentially Complete Pathway
● Complete Pathway

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The terrestrial environment was evaluated during the CSE Phase II for the Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002) at Hancock Field ANGB. The groundwater system and the aquatic environment were not evaluated during the CSE Phase II:

- The fate and transport of contaminants at Hancock Field ANGB are strongly influenced by physical and chemical properties, as well as by environmental factors such as soil characteristics and groundwater flow.
- Lead is a naturally occurring metal found in small amounts in the earth's crust. The migration of lead in the subsurface environment is controlled by the solubility of different lead complexes and their adsorption to soil and organic materials. Lead is nonvolatile and has a high soil-water partition coefficient (K_d), which means that it is relatively immobile in soil. The solubility of lead is influenced by both the chemical form of the lead and the chemistry of the soil in which it is deposited. Generally, mobility of lead decreases with increasing soil pH. Soils rich in phosphates and/or sulfides also reduce lead mobility as soluble lead readily forms insoluble phosphate and sulfide complexes. Lead from bullets or lead shot exists as metallic lead or lead antimony alloy, both of which have very low solubility and are likely to remain near the soil surface in particle form.

8.2.1 Soil Exposure Pathway Analysis

As shown in **Figures 8-1** and **8-2**, each MC exposure pathway includes a source, a release mechanism, an exposure medium, an exposure route, and a receptor. MC impacted soils occur in surface and near-surface soils. Human and ecological exposure can occur through dermal contact with the soil or by ingestion. If soils are disturbed exposure may also occur through dust inhalation.

8.2.1.1 Soil Exposure Receptors

Appropriate human and ecological receptors to soil (surface and subsurface) were selected for Hancock Field ANGB based on site-specific conditions. The current land use for the MRAs on Hancock Field ANGB is not projected to change. However, future land use designations for the MRAs at Hancock Field ANGB may conceivably include residential, commercial, and light industrial. Thus, human receptor subcategories that are considered for this evaluation include current and future authorized site personnel and contractors, and trespassers. Potential future receptors could also include residential and commercial/industrial workers. Ecological receptors (plant and animal) are also considered given the viable habitat that exists near and within the Hancock Field ANGB boundaries.

8.2.1.2 Soil Exposure Conclusions

Soil sampling (XRF and lead correlation sampling) was performed at the Small Arms Range and Shooting-In Buttress (SR001) and the Firing-In Buttress (SR002) during the CSE Phase II at Hancock Field ANGB, as described in **Sections 5.2 and 5.3**.

Fifty-four soil samples were collected at the Small Arms Range and Shooting-In Buttress (SR001) for on-site XRF lead analysis, with ten additional correlation analysis samples. Lead at SR001 was detected at concentrations ranging from 22 mg/kg to 5217 mg/kg. Twenty-six soil samples were collected at the Firing-In Buttress (SR002) for on-site XRF analysis for lead, with two additional correlation analysis samples. Lead results ranged from < LOD to 585 mg/kg at SR002. The LOD for the XRF analyses of Hancock Field ANGB soils was approximately 13 mg/kg. Because lead was detected in both MRAs, surface soil exposure pathways are considered complete. Because lead was detected in the subsurface at concentrations exceeding the action level, subsurface soil pathways are considered complete for all receptors except visitors/trespassers, which are unlikely to engage in ground disturbing activities.

8.2.2 Surface Water and Sediment Migration Pathway Analysis

The following presents the potential surface water and sediment exposure pathways at the Hancock Field ANGB.

8.2.2.1 Surface Water and Sediment Receptors

Hancock Field and surrounding areas contain naturally-occurring swamps and poorly-drained areas. Although there are wetlands located in the southern and eastern portion of the installation, no wetlands occur at any of the MRAs (USACE, 2009). A small creek runs through the Firing-In Buttress (SR002) from north to south. Human and ecological receptors to surface water and sediment are analogous to the soil receptors described above, although human contact with these media would be of much lower intensity. Ecological receptors at SR002 include plants, terrestrial organisms utilizing surface water as a drinking water source, and aquatic organisms living in surface water and sediment. These pathways were considered potentially complete pending results of the soil sampling analysis. Those results show that all samples adjacent to the creek contain lead less than the 95^{th} percentile background concentration for the Eastern U.S., which indicates that transport pathways to the creek are likely incomplete.

8.2.2.2 Surface Water and Sediment Conclusions

Surface water and sediment sampling was not performed during this CSE Phase II field activities. During the scoping phase of the project, it was determined that the media most likely impacted by the MC associated with past range activities at Hancock Field ANGB was soil. Because of the presence of a small creek at the Firing-In Buttress (SR002), the surface water and sediment were considered potentially complete exposure pathway pending the soil sampling results for MC at this MRA. Based on the results illustrated in **Figure 5-4**, which shows that the 14 samples closest to the Western Branch of Ley Creek all contained lead concentrations less that the 95^{th} percentile background concentration for soils in the Eastern U.S. (38 mg/kg; USEPA, 2003), surface water and sediment pathways are now considered incomplete.

8.2.3 Groundwater Migration Pathway Analysis

8.2.3.1 Groundwater Receptors

As described in **Section 3.5**, unconsolidated lake sediments occur from 0 to 50 ft below ground surface (bgs), glacial till from 50 to 80-100 ft bgs, and sedimentary bedrock beneath the till. The lake sediments contain an unconfined, non-sole source water table aquifer, which occurs several feet bgs. Due to low transmissivity, the aquifer is not a suitable source of potable water. A confined aquifer is found in the bedrock below the glacial till, which serves as a barrier to vertical groundwater migration between the overlying lake sediments and underlying sedimentary bedrock. Human and ecological receptors may come in contact with shallow, unconfined groundwater during ground intrusive activities or, at the Firing-In Buttress (SR002), groundwater that is released to surface water at the creek.

8.2.3.2 Groundwater Conclusions

Groundwater sampling was not performed for the CSE Phase II at Hancock Field ANGB pending outcome of the soil sampling. During the scoping phase of the project, it was determined that the media most likely impacted by the MC associated with past range activities at Hancock Field ANGB was soil, and other media would be sampled in subsequent investigations only if soil results suggested a need for sampling those media. Subsurface soil samples were only taken as step-out samples, collected due to an elevated surface sample result. Consequently they should not be treated as representative of subsurface samples across the site. As shown in **Figures 5-2** and **5-4**, soil concentrations of lead decrease with depth in the six-inch sampling intervals at locations where subsurface samples were collected. This is consistent with the chemical properties of lead – specifically with regards to solubility. In all subsurface soil sampling locations, lead concentrations in the bottommost (up to 2 ft bgs) sample were below the modified residential screening criterion of 261 mg/kg. Since lead concentrations in soil decrease with depth and are below the action level at depths shallower than the unconfined aquifer, it is unlikely that this groundwater has been impacted. However, because lead in the bottommost sampling intervals (18-24 in. bgs) was greater than 95^{th} percentile background concentrations (USEPA, 2003), transport pathways to the shallow water table aquifer are considered potentially complete. Exposure pathways to shallow groundwater are considered potentially complete for rooted plants, and for all human receptor categories except visitors/trespassers, which are unlikely to engage in activities that would result in contact with groundwater.

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9.0 Screening Level Human Health Risk Assessment

9.1 General Approach

A screening level Human Health Risk Assessment (HHRA) was performed for the Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002) MRAs at Hancock Field ANGB. As discussed in **Section 8.0**, CSMs were developed to address lead environmental contamination. The CSMs describe sources of contamination, potentially complete present-day and future exposure pathways, and possible receptors. The pathways and receptors for each MRA are described in **Section 8.0** and summarized in **Figure 8-1** and **Figure 8-2**. This section focuses on the complete or potentially complete pathways and discusses associated human health risks.

9.1.1 Human Health Screening Criteria

To evaluate potential human health risks, the measured concentrations in environmental media (surface and subsurface soil samples) at each MRA were compared with residential human health screening criteria. Screening criteria for the environmental media investigated for the CSE Phase II were discussed previously in **Section 4.3.1.1** and presented in **Table 4-1**. These screening criteria are also briefly discussed below.

Maximum detected lead concentrations measured by XRF analysis in soil samples were screened against the human health screening criteria provided in **Table 4-1**. Use of the XRF results for this screening is appropriate as discussed in **Section 5.4**. There were multiple exceedances of residential human health soil screening criteria at the Small Arms Range and Shooting-In Buttress (SR001). There were also some exceedances for residential human health soil screening criteria lead at the Firing-In Buttress (SR002) in sample sites adjacent to the Firing-In Buttress structure.

9.1.1.1 Soil Screening Levels

XRF field sampling results generated during the CSE Phase II at Hancock Field ANGB were compared to scenario-specific human health screening levels to determine if contaminant releases have occurred at concentrations exceeding levels of potential concern. The human health screening levels are discussed in **Section 4.3.1.1** and presented in **Table 4-1.**

9.1.1.2 Surface Water and Sediment Screening Levels

As discussed in **Section 8.2.2**, surface water and sediment were not evaluated during the CSE Phase II activities, pending outcome of the surface and subsurface soil sampling.

9.1.1.3 Groundwater Screening Levels

As discussed in **Section 8.2.3**, groundwater was not evaluated during the CSE Phase II activities, pending outcome of the surface and subsurface soil sampling.

9.1.1.4 Background Screening Levels

As described in **Section 4.2.3**, a completed background study for Hancock Field ANGB was not available at the time of the CSE Phase II investigation. A summary of background soil concentrations for lead is provided here based on U.S. soil data described in USEPA, 1993. USEPA, 1993 performed a comprehensive analysis of published lead background studies for the eastern United States. The 50th and 95th percentiles of lead background soil concentrations in this USEPA report are 18 mg/kg and 38 mg/kg, respectively.

Additionally, NYDEC has provided a statement regarding naturally-occurring and anthropogenic lead soil concentrations in a footnote to **Table 4-1** (Recommended soil cleanup objectives; Heavy Metals) of *Determination of Soil Cleanup Objectives and Cleanup Levels* (www.*accreditedanalytical.com/forms/NY-Heavy-Metals.pdf*). This footnote states, "Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 pap. Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200-500 pap."

9.2 Pathways and Receptors

A discussion of potentially complete environmental exposure pathways and potential receptors for lead is provided in **Section 8.0** of this report. The primary exposure routes for lead in soil are through dermal contact, ingestion, and inhalation. Current human receptors include authorized site personnel and contractors, visitors, and trespassers. Residential and occupational receptors are considered to be potentially present at future dates.

9.3 Media Screening Results

Maximum concentrations of lead detected by XRF in surface and subsurface soil samples at the two Hancock Field ANGB MRAs were compared to human health screening levels. Groundwater, surface water and sediment were not sampled in the CSE Phase II.

9.4 Small Arms Range and Shooting-In Buttress (SR001)

This section presents results of the HHRA screening for surface and subsurface soil samples at the Small Arms Range and Shooting-In Buttress (SR001). The human health screening results using maximum soil concentrations at this MRA are summarized in **Table 9-1**.

9.4.1 Surface Soil Screening

As shown in **Table 5-2**, 40 surface soil samples (0 – 0.5 ft) were collected at the Small Arms Range and Shooting-In Buttress (SR001) for on-site XRF lead analysis. Lead was detected in surface soil at concentrations ranging from 22 mg/kg to 5217 mg/kg. Of the 40 surface soil samples, 12 samples had lead concentrations exceeding the modified residential soil criterion of 261 mg/kg. The NYDEC soil cleanup objective for lead is equivalent to the site-specific background soil level. Although site-specific background has not been established for Hancock Field ANGB, 32 of the 40 surface soil samples had concentrations exceeding the 95th percentile of lead background soil concentrations in the eastern United States (38 mg/kg; USEPA, 1993).

9.4.2 Subsurface Soil Screening

There were fourteen subsurface soil samples (eleven at 6-12 in. bgs; two at 12-18 in. bgs; one at 18-24 in. bgs) collected at the Small Arms Range and Shooting-In Buttress (SR001) for on-site XRF lead analysis. Subsurface samples are step-out samples which were collected when an elevated lead concentration was measured on the surface; thus they do not provide an unbiased measure of subsurface conditions. Four subsurface soil samples (3 from a depth of 6-12 in. bgs, 1 from a depth of 12-19 in. bgs) exceeded the modified residential soil criteria. The NYDEC soil cleanup objective for lead is equivalent to the site-specific background soil level. Although site-specific background has not been established for Hancock Field ANGB, all of the 14 subsurface soil samples had concentrations exceeding the 95^{th} percentile of lead background soil concentrations in the eastern United States (38 mg/kg; USEPA, 1993).

9.4.3 Human Health Risk Assessment Conclusions

Based on the results of the HHRA screening for the Small Arms Range and Shooting-In Buttress (SR001), concentrations for lead in surface soil may present a significant human health risk under residential land use scenarios. Four (4) of 14 subsurface soil samples had a lead concentration that exceeded the residential soil screening criteria. Using a simple screening protocol that employs the maximum detected soil concentration, a conclusion is made that subsurface soils may present human health risk under residential land use scenarios.

A review of **Figure 5-2** indicates that not all areas of the Small Arms Range and Shooting-In Buttress (SR001) are equally contaminated. The highest soil lead concentrations were measured in the northeast portion of the MRA, within the area delineated by three soil berms and the concrete firing pad. Soil lead concentrations exceeding the criteria shown in **Table 9-1** were only measured in soil samples from within this region of the MRA.

Table 9-1 Human Health Risk Assessment Screening Summary, Small Arms Range and Shooting-In Buttress (SR001)

Chemical (Inorganics)	Lead
Niton XL3t XRF analyzer	USEPA Method 6200
Frequency Detected	54/54
Maximum Detected Concentration; 0 - 0.5 ft (mg/kg)	5217
Qualifier	–
Maximum Detected Concentration; 0.5 – 2 ft (mg/kg)	902
Qualifier	–
Residential Screening Level (mg/kg)	261
Source	USEPA
Above Residential Screening Level (Yes or No)	Yes

Notes:
USEPA = U.S. Environmental Protection Agency, Regional Screening Level (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/). (USEPA, 2011).
mg/kg = (milligrams per kilogram).

9.5 Firing-In Buttress (SR002)

This section presents results of the HHRA screening for surface and subsurface soil samples at Firing-In Buttress (SR002). The human health screening results using maximum soil concentrations at this MRA are summarized in **Table 9-2**.

9.5.1 Surface Soil Screening

As shown in **Table 5-3**, 23 surface soil samples (0 – 0.5 ft) were collected at the Firing-In Buttress (SR002) for on-site XRF lead analysis. Lead was detected in surface soil at concentrations ranging from < LOD (approximately 10 mg/kg) to 368 mg/kg. Of the 23 surface soil samples, only one exceeded the modified residential soil criterion of 261 mg/kg. The NYDEC soil cleanup objective for lead is equivalent to the site-specific background soil level. Although site-specific background has not been established for Hancock Field ANGB, only two of the 23 surface soil samples had concentrations exceeding the 95th percentile of lead background soil concentrations in the eastern United States (38 mg/kg; USEPA, 1993).

9.5.2 Subsurface Soil Screening

Three subsurface soil samples (one each at 6-12 in. bgs, 12-18 in. bgs, and 18-24 in. bgs) were collected at the Firing-In Buttress (SR002) for on-site XRF lead analysis. As shown in **Figure 5-4**, these three samples were collected at the same location (near the impact berm) as the surface soil sample measuring 368 mg/kg lead. The second and third of the four soil intervals at this location (soil samples C-XR-HF-02-SB1-209 and C-XR-HF-02-SB1-209) had lead concentrations exceeding the 400 mg/kg residential soil criterion. All three subsurface soil samples exceeded the 95th percentile background concentration for lead in the eastern United States (38 mg/kg; USEPA, 2003).

9.5.3 Human Health Risk Assessment Conclusions

Based on the results of the HHRA screening for the Firing-In Buttress (SR002), lead concentrations in surface soil are unlikely to present a significant human health risk under residential or industrial land use scenarios.

Only a single surface soil sample and two subsurface samples (all at the same location) contained concentrations exceeding the modified action level of 261 mg/kg. These samples were obtained at location C-XR-HF-02-209 where small arms debris was noted and the maximum surface soil value of 368 mg/kg was measured. Two of the three subsurface samples, at the 6-12 in. depth (585 mg/kg) and 12-18 in. depth (431 mg/kg), exceeded the residential screening criterion of 400 mg/kg. The last sample interval of 18-24 in. depth had a lead concentration of 195 mg/kg. Hence, lead concentrations decrease with depth below 6-12 in. at this sampling location. Surface soil delineation samples collected adjacent to C-XR-HF-02-209 did not have lead concentrations above the 400 mg/kg residential soil criterion, indicating that the area of lead contamination above screening criteria is limited. However, based on a simple screening that utilizes the maximum detected soil concentration and a conservative modified screening level, a conclusion is made this one location may present human health risk under a residential land use scenario.

Table 9-2 Human Health Risk Assessment Screening Summary, Firing-In Buttress (SR002)

Chemical (Inorganics)	Lead
Niton XL3t XRF Analyzer	USEPA Method 6200
Frequency Detected	24/26
Maximum Detected Concentration; 0 - 0.5 ft (mg/kg)	368
Qualifier	–
Maximum Detected Concentration; 0.5 - 2 ft (mg/kg)	585
Qualifier	–
Residential Screening Level (mg/kg)	261
Source	USEPA
Above Residential Screening Level (Yes or No)	Yes

Notes:
USEPA = U.S. Environmental Protection Agency, Regional Screening Level (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/). (USEPA, 2011)
mg/kg = (milligrams per kilogram).

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10.0 Screening Level Ecological Risk Assessment

10.1 General Approach

A focused Screening Level Ecological Risk Assessment (SLERA) was completed to assess potential adverse impacts on current or future ecological receptors exposed to MC in surface soil at Hancock Field ANGB MRAs. The assessment endpoint for the SLERA is the protection of local populations and communities of biota from adverse impacts from lead and PAHs in soil. The MC CSMs for Hancock Field ANGB MRAs are described in **Section 8.0** and presented in **Figure 8-2** and **Figure 8-3**. As discussed in **Section 8.2.2** and **8.2.3**, surface water, sediment, and groundwater were not sampled in the CSE Phase II investigation, pending outcome of the soil sampling. Therefore, ecological screening is limited to soil results.

10.2 Ecological Screening Criteria

Analytical laboratory data generated during the CSE Phase II at Hancock Field ANGB were compared to conservative ecological screening levels to determine if contaminant releases have occurred at concentrations exceeding levels of potential concern. The ecological screening levels are discussed in **Subsection 4.2.1.2** and presented in **Table 4-1**.

The ecological screening level for lead in soil is based on the lowest benchmark derived by the US EPA in the development of Eco SSLs for lead. The screening value of 11 mg/kg is based on protection of insectivorous birds, but EPA also developed benchmarks based on protection of plants, soil invertebrates, herbivorous and carnivorous birds, and herbivorous, insectivorous, and carnivorous mammals, as shown in **Table 10-1**. In developing the Eco SSL for lead, EPA noted that the chosen screening level of 11 mg/kg is less than the 95th percentile background concentration for lead in the eastern United States (38 mg/kg; USEPA, 1993).

Table 10-1 EPA Ecological Soil Screening Levels for Lead

	Plants	Soil Invertebrates	Herbivorous Birds	Insectivorous Birds	Carnivorous Birds	Herbivorous Mammals	Insectivorous Mammals	Carnivorous Mammals
	Soil Screening Level (mg/kg)							
Lead*	120	1,700	46	11	510	1,200	56	460

* EPA EcoSSL (http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_lead.pdf). (USEPA, 2005)

10.3 Habitat and Receptors

Ecological receptors (i.e., plants, invertebrates, vertebrate herbivores, omnivores, and carnivores) could potentially be exposed to MC that may exist at the MRAs. The vegetation community in the vicinity of the MRAs is described in **Subsection 3.4.2**. At the areas under consideration, grass height is maintained by mowing. Potential ecological receptors include soil invertebrates, small mammals (i.e., meadow voles, shrews), and insectivorous birds (i.e., American robin). Likely predators utilizing the areas may include fox, kestrel and red-tail hawk. A small creek runs through the Firing-In Buttress MRA (SR002). No sediment or surface samples were collected from the creek.

10.3.1 Base Habitat and Receptors

Natural vegetation communities at Hancock Field ANGB are largely absent because of past construction activities and the changed elevation of the area. The vegetation consists of manicured lawns, landscaped areas, fields, and wooded areas. There are two animal species (reptiles) listed by the state of New York as endangered (Bog Turtle and Eastern Massasauga Rattlesnake) and one animal species (Black Tern) that is protected by the state. Six plant species within four miles of Syracuse are listed by the state as rare, vulnerable, or threatened, according to the New York State Department of Environmental Conservation Wildlife Resources Center. The six plant species are the Weak Stellate Sedge, Large Twayblade, Southern Twayblade, Pod Grass, Calypso, and Marsh Valerian. It is unknown if any of the species are present at Hancock Field. No threatened or endangered species have been observed at any of the MRAs (USACE, 2009).

There are no known or suspected cultural or archaeological sites located at any of the MRAs at Hancock Field ANGB (USACE, 2009).

10.3.2 Small Arms Range and Shooting-In Buttress (SR001)

The 3.7 acre Small Arms Range and Shooting-In Buttress is located in the south-central portion of Tract II. The site currently consists of vacant land with remnants of the small arms facilities. The vegetation is overgrown and consists of heavy shrubs with trees.

10.3.3 Firing In Buttress (SR002))

The 5.8 acre Firing-In Buttress is located in the eastern portion of Tract III, south of the northwest-southeast runway. The area is vacant and has no current use. Besides the revetment structure, the area predominantly consists of an overgrown field with heavy shrubs and a few trees.

10.4 Media Screening Results

XRF field sampling results generated during the CSE Phase II at Hancock Field ANGB were compared to conservative ecological screening values to determine if contaminant releases have occurred at concentrations exceeding levels of potential concern. The ecological screening levels are discussed in **Subsection 4.2.1.1** and presented in **Table 4-1**.

All detected concentrations in soil greater than the ecological levels are considered to potentially adversely impact ecological receptors. The recommended ecological screening level for lead was determined as 11 mg/kg, from USEPA EcoSSL (2005, *Ecological Soil Screening Levels for Lead Interim Final* OSWER Directive 9285.7-70, March). This ecological screening level is protective of plants, soil invertebrates, and wildlife. Soil screening levels for all receptors considered in the USEPA's EcoSSL for lead are presented in **Table 10-1**.

10.4.1 Small Arms Range and Shooting-In Buttress (SR001)

Surface and subsurface soil samples were collected at this MRA. The focused SLERA results for maximum soil concentrations in Small Arms Range and Shooting-In Buttress MRA are summarized in **Table 10-2**.

10.4.1.1 Soil Screening Level Effects Assessment

A total of 40 surface and 14 subsurface ex-situ XRF lead readings were obtained for the Small Arms Range and Shooting-In Buttress (SR001); lead was detected in every XRF sample at concentrations ranging from 22 mg/kg to 5217 mg/kg. The maximum concentration for lead was above the ecological screening criteria of 11 mg/kg **Table 10-2**. In fact, lead in every sample exceeded the limiting EcoSSL (**Table 10-3**).

As discussed in **Section 10.2**, EPA Eco SSLs were developed by modeling bioaccumulation and toxicity to eight different ecological receptor categories, with the resulting most sensitive receptor being chosen as the source for the screening threshold. **Table 10.3** presents the results of the soil screening for Small Arms Range and Shooting-In Buttress (SR001) expanded to all eight ecological receptor categories.

Because invertebrates and vertebrates are mobile and can be expected to traverse the entirety of the site, use of the mean lead concentration is representative of the concentration to which a mobile receptor would be exposed. The mean lead concentration in the Small Arms Range and Shooting-In Buttress (SR001) surface soil (0”-6”)was 538 mg/kg, which is greater than the 95^{th} percentile background concentration for soils in the eastern United States (38 mg/kg; USEPA, 2003). Mean lead concentrations exceeded screening thresholds for six of the eight ecological receptors. Screening levels for invertebrates, and herbivorous mammals, are not exceeded by mean lead concentrations. Soil concentrations that exceed the human health screening level of 261 mg/kg, and thus would likely be the focus of remedial activities, are concentrated in the north-central part of the site, as shown by the samples in orange in **Figure 5-2**. Outside of that area (samples in blue in **Figure 5-2**), while there are no results that exceed the human health screening level, the mean lead concentration in surface soil is 72.3 mg/kg, which is still nearly twice the 95^{th} percentile of background concentrations for soils in the eastern United States and exceeds ecological screening levels for three ecological receptor groups (herbivorous birds, insectivorous birds, and insectivorous mammals).

10.4.1.2 Ecological Risk Assessment Conclusions

The assessment endpoint for the SLERA is the protection of local populations and communities of biota from adverse impacts. Based on the results of the focused SLERA, maximum and mean lead concentrations were orders of magnitude above the ecological risk screening criterion intended to be protective of soil invertebrates, plants and wildlife. Receptor-specific soil screening levels were also exceeded for plants, herbivorous and insectivorous birds and insectivorous and carnivorous mammals. As such, data suggest that additional ecological investigation is warranted for SR001.

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Table 10-2 Ecological Risk Assessment Screening, Small Arms Range and Shooting-In Buttress (SR001)

Chemical	Frequency Detected-All Samples	Maximum Detected Concentration (mg/kg)	Mean (mg/kg) - All Samples	Screening Level (mg/kg)	Source	Above Screening Level (Yes or No)
Lead	54/54	5,217	456	11	USEPA	Yes

Notes:
mg/kg = milligrams per kilogram.
USEPA = Ecological Soil Screening Level for Lead (EcoSSLs) (USEPA, 2005).

Table 10-3 Expanded Ecological Risk Screening for All Receptor Categories, Small Arms Range and Shooting-In Buttress (SR001)

Screening-level Receptor	EPA Eco SSL (mg/kg)	Maximum Detected Surface Soil (0"-6") Conc. (mg/kg)	Number of Detects (0"-6") Exceeding Eco SS	Number of Detects (>6") Exceeding Eco SSL	Mean Surface Soil (0"-6") Conc. (mg/kg)	Does Mean Surface Soil Concentration Exceed Eco SSL?
Plants	120	5,217	17/40	10/14	538	Yes
Soil Invertebrates	1,700	5,217	4/40	0/14	538	No
Herbivorous Birds	46	5,217	30/40	14/14	538	Yes
Insectivorous Birds	11	5,217	40/40	14/14	538	Yes
Carnivorous Birds	510	5,217	7/40	1/14	538	Yes
Herbivorous Mammals	1,200	5,217	4/40	0/14	538	No
Insectivorous Mammal	56	5,217	26/40	13/14	538	Yes
Carnivorous Mammals	460	5,217	7/40	1/14	538	YES

Notes:
mg/kg = milligrams per kilogram.
EPA Eco SSL = Ecological Soil Screening Level for Lead (EcoSSLs) (USEPA, 2005).

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10.4.2 Firing-In Buttress (SR002)

Surface soil samples were collected at this MRA. The focused SLERA for surface soil is summarized below.

10.4.2.1 Soil Screening Level Effects Assessment

A total of 23 surface and 3 subsurface ex-situ XRF lead readings were obtained for the Firing-In Buttress (SR001); lead was detected in 24 of 26 XRF samples at concentrations ranging from less than the limit of detection (10 mg/kg) to 585 mg/kg. The maximum concentration for lead was above the ecological screening criteria of 11 mg/kg **Table 10-4**. In fact, lead in every sample in which it was detected exceeded the limiting EcoSSL (**Table 10-5**).

As discussed in Section 10.2, EPA Eco SSLs were developed by modeling bioaccumulation and toxicity to eight different ecological receptor categories, with the resulting most sensitive receptor being chosen as the source for the screening threshold. **Table 10-5** presents the results of the soil screening for Firing-In Buttress (SR002) expanded to all eight ecological receptor categories.

Because invertebrates and vertebrates are mobile and can be expected to traverse the entirety of the site, use of the mean lead concentration is representative of the concentration to which a mobile receptor would be exposed. The mean lead concentration in the Firing-In Buttress (SR002) surface soil (0”-6”) was 38.2 mg/kg, which is approximately equal to the 95^{th} percentile background concentration for soils in the eastern U.S., (38 mg/kg;USEPA, 2003). Mean surface soil lead concentrations exceeded screening thresholds for only one of the eight ecological receptors. Screening levels for plants, invertebrates, herbivorous mammals, herbivorous birds, insectivorous mammals, carnivorous birds and carnivorous mammals are not exceeded by mean lead concentrations in surface soil. Though concentrations of lead exceeded the most sensitive ecological screening criterion in all samples in which lead was detected, the human health screening criterion was exceeded at only one sample location (Sample Location 209). In the remaining 22 surface sample locations, the mean lead concentration in surface soil was 23.2, which is less than the 95^{th} percentile background concentration for soils in the eastern United States (USEPA, 1993).

10.4.2.2 Ecological Risk Assessment Conclusions

The assessment endpoint for the SLERA is the protection of local populations and communities of biota from adverse impacts. Based on the results of the focused SLERA, maximum lead concentrations exceeded the ecological risk screening criterion intended to be protective of soil invertebrates, plants and wildlife. However, mean surface soil concentration exceeded screening criteria for only the most sensitive receptor category, and were approximately equal to the 95^{th} percentile background concentration for the eastern U.S. Because mean concentrations are similar to published regional background values, it is unlikely that lead concentrations at SR002 represent unacceptable risk to ecological populations. Therefore, no additional ecological evaluation is recommended for SR002.

Table 10-4 Ecological Risk Assessment Screening, Firing-In Buttress (SR002)

Chemical	Frequency Detected (All Samples)	Maximum Detected Surface Soil (0" – 6") Concentration (mg/kg)	Mean [a] Surface Soil (0"-6") Concentration (mg/kg)	Screening Level (mg/kg) [b]	Source	Above Screening Level (Yes or No)
Lead	24/26	585	38.2	11	USEPA	Yes

Notes: mg/kg = milligrams per kilogram.
[a] Mean calculated using limit of detection (10 mg/kg) to represent values for the two non-detected sample results.
[b] USEPA = Ecological Soil Screening Level for Lead (EcoSSLs) (USEPA, 2005).

Table 10-5 Expanded Ecological Risk Screening for All Receptor Categories, Firing-In Buttress (SR002)

Screening-level Receptor	EPA Eco SSL [a] (mg/kg)	Maximum Detected Surface Soil (0"-6") Conc. (mg/kg)	Number of Detects (0"-6") Exceeding Eco SSL	Number of Detects (>6") Exceeding Eco SSL	Mean Surface Soil (0"-6") Conc. [b] (mg/kg)	Does Mean Conc. Exceed Eco SSL?
Plants	120	585	41/23	3/3	38.2	No
Soil Invertebrates	1,700	585	0/23	0/3	38.2	No
Herbivorous Birds	46	585	2/23	3/3	38.2	No
Insectivorous Birds	11	585	21/23	3/3	38.2	Yes
Carnivorous Birds	510	585	0/23	1/3	38.2	No
Herbivorous Mammals	1,200	585	0/23	0/3	38.2	No
Insectivorous Mammal	56	585	2/23	3/3	38.2	No
Carnivorous Mammals	460	585	0/23	1/3	38.2	No

Notes: mg/kg = milligrams per kilogram.
[a] EPA Eco SSL = Ecological Soil Screening Level for Lead (EcoSSLs) (USEPA, 2005).
[b] - Mean calculated using limit of detection (10 mg/kg) to represent values for the two non-detected sample results.

11.0 Summary and Conclusions

This section summarizes the significant results obtained and conclusions reached as a result of the CSE Phase II activities conducted at Hancock Field ANGB. The most significant findings are presented in this section and are reproduced directly or abstracted from information contained in the report. The conclusions provide general and comparative interpretations of the findings, in terms of the general objectives of the CSE Phase II.

11.1 Summary of Comprehensive Site Evaluation Phase II Activities

This CSE Phase II compiled and evaluated information about Hancock Field ANGB relating to the possible presence of MEC and associated contamination of environmental media from MC. The CSE Phase II activities included visual surveys and XRF sampling. This information was reviewed and used to develop and refine CSMs for potential exposures to MEC and MC for the MRAs at Hancock Field ANGB. The CSMs related the potential sources of MEC and MC to potential human and ecological exposures at the MRAs in consideration of current and projected future land uses. These potentially complete exposure pathways also considered possible transport or migration of MEC items as the result of natural processes or human activities, as well as impacts associated with migration of MC contaminants associated with MEC. Land use scenarios were evaluated with respect to how human and ecological receptors would interact with the land at Hancock Field ANGB. The compiled information was then used to conduct an assessment of the potential explosive and environmental hazards of Hancock Field ANGB MRAs through application of the MRSPP.

11.2 Summary of Comprehensive Site Evaluation Phase II Findings

The CSE Phase II resulted in the collection and evaluation of a large amount of information and data regarding past military munitions-related activities at Hancock Field ANGB , current on-site conditions with respect to the presence of MEC and MC, physical setting of the land, and plans for future use of the property. A summary of findings for each MRA, based on data collected during the CSE Phase II is provided in this section.

11.2.1 Modified Action Level

During field operations the action level was 400 mg/kg. Due to correlation issues discussed in **Section 5.4** the action level was conservatively reduced to 261 mg/kg. All possible further munitions action were based upon the modified 261 mg/kg action level.

11.2.2 Small Arms Range and Shooting-In Buttress (SR001)

The Small Arms Range and Shooting-In Buttress (SR001) occupies approximately 3.7 acres. The Small Arms Range and Shooting-In Buttress (SR001) is located in the south-central portion of Tract II. The southern portion of the area extends beyond the Tract II boundary and onto land currently owned by the City of Syracuse. The area consists of vacant land with remnants of small arms facilities. There is a fence surrounding a majority of the MRA but there is no gate to restrict access.

During the CSE Phase II visual surveys, evidence of small arms activities including berms and practice target structures were observed. In addition, small arms and munitions debris were observed within the range and along the access road. No other suspected munitions items or hazardous waste items were noted.

A total of 54 XRF samples were collected and analyzed from Small Arms Range and Shooting-In Buttress (SR001) utilizing XRF technology. The XRF results ranged from 13 mg/kg to 5217 mg/kg. Eight samples exceeded the human health regulatory action level for lead of 400mg/kg, 16 samples exceeded the modified action level of 261 mg/kg (see **Section 5.2.7.1** and **Table 5-2** for more detailed information).

The assessment endpoint for the SLERA is the protection of local populations and communities of biota from adverse impacts. Based on the results of the focused SLERA, lead was at concentrations above the ecological risk screening criterion intended to be protective of soil invertebrates, plants and wildlife. Receptor-specific soil screening levels were also exceeded for plants, herbivorous and insectivorous birds and insectivorous and carnivorous mammals.

11.2.3 Firing-In Buttress (SR002)

The Firing-In Buttress (SR002) occupies approximately 5.8 acres. The Firing-In Buttress (SR002) is located in the eastern portion of Tract III, south of the northwest-southeast runway. The area is densely vegetated. Public access is restricted to the MRA.

During the CSE Phase II visual surveys, evidence of small arms activities, small arms and munitions debris were observed. No other suspected munitions items or hazardous waste items were noted.

A total of 26 XRF samples were collected and analyzed from Firing-In Buttress (SR002) utilizing XRF technology. The XRF results ranges from <LOD to 585 mg/kg. Two of the subsurface soil samples exceeded the human health regulatory action level for lead of 400 mg/kg, 3 samples exceeded the modified action level of 261 mg/kg (see **Section 5.3.7.2** and **Table 5-3** for more detailed information).

Based on the results of the focused SLERA, surface soil chemical concentrations for lead within the Firing-In Buttress (SR002) were detected above the conservative ecological screening criterion intended to be protective of soil invertebrates, plants and wildlife. Receptor-specific soil screening levels were also exceeded for herbivorous birds and insectivorous mammals and birds.

In addition, during the scoping phase of the project, it was determined that the media most likely impacted by the MC associated with past range activities at Hancock Field ANGB was soil. Given the presence of a small creek running through the Firing-In Buttress (SR002), surface water and sediment are a potentially complete exposure pathway for MC. As indicated in the screening assessment, aquatic resources will be evaluated further if contamination in the medium of concern (i.e., soil) has the potential to cause adverse effects in exposed ecological receptors. There were no elevated lead results near the creek in the Firing-In Buttress (SR002)

11.2.4 MRA Assessment of Potential Munitions Constituent Releases

Based on the findings of this CSE Phase II, there is evidence of MC releases at the Small Arms Range and Shooting-In Buttress (SR001) and the Firing-In Buttress (SR002) that indicates further action is warranted for these MRAs.

11.3 Cohort Assignment

To comply with the USAF Knowledge Driven/Performance-based Management initiative, the MRAs are subdivided into seven "cohorts". The assignment of MRAs to different cohorts supports the streamlining of the restoration process, including the development and implementation of presumptive remedies for specific cohort types. The cohort type will be reflected in the site description in EESOH-MIS. The seven MMRP cohorts are shown in **Table 11-1**.

Table 11-1 MMRP Cohort Assignments

Cohort Type	Cohort Description
A	Small Arms Ranges
B	Boresight Ranges
C	Explosive Ordnance Disposal (EOD) Ranges and Open Burn/Open Detonation (OB/OD) Sites
D	Chemical Warfare Material (CWM) Sites
E	Pyrotechnic/Practice Sites
F	All Other Sites
G	Munitions Constituents

As the MMRP evolves, the cohort assignments may be expanded or consolidated to reflect what has been learned about the MRA. In implementation of the CSE Phase II, the cohort type was defined by the range-type as designated in documentation. Any MRA with a site description of "multi-use" in EESOH-MIS shall be assigned a site description that reflects a specific cohort. The site description shall be revised to the range-type designated in documentation. The cohort assignment for the Small Arms Range and Shooting-In Buttress (SR001 and SR001a) will remain as a small arms range. The original and primary use of the area was for a small arms range and it is believed that the 40mm practice grenade use was incidental.

The cohort types recommended for the Hancock Field ANGB MRAs are as follows:

A- Small Arms Range - Small Arms Range and Shooting-In Buttress (SR001).

A- Small Arms Range - Small Arms Range and Shooting-In Buttress (SR001a).

B- Boresight Ranges - Firing-In Buttress (SR002).

B- Boresight Ranges - Firing-In Buttress (SR002a).

11.4 Additional Munitions Response Site Designations (Splitting the Munitions Response Areas)

Based on information gathered during the CSE Phase I and Phase II investigations, and depending on site-specific factors, each MRA may be designated as a single MRS or it may be subdivided for the purposes of evaluation and response into multiple MRSs. Subdividing MRAs into multiple MRSs allows for characterization that is more efficient so that munitions responses specific to local conditions can be conducted. Areas within a

MRA where the presence of MEC is not suspected or had not been confirmed during the CSE Phase I and Phase II can be aggregated into a single MRS.

A MRA must be comprised of at least one MRS and may contain multiple MRSs. The total area of all MRSs contained within a MRA cannot be less than the original MRA area. The MRS area must be equal to or greater than the original MRA area. This will ensure that the total acreage within a MRA is accounted for after the MRS split. Typical site-specific factors that may be considered during the subdivision of MRAs into MRSs include:

- The prevalence of MEC or the extent of MC contaminated media present within different areas of the MRA.
- The type of MEC or MC present within the MRA.
- Physical features (vegetation, topography, land areas versus water bodies, accessibility, and location of receptors that may be potentially exposed to MEC, etc.).
- Geological and hydrogeological characteristics.

The data for the MRAs at Hancock Field ANGB were evaluated to determine the appropriate designation of MRSs. Based on this evaluation; it is recommended that the Small Arms Range and Shooting-In Buttress (SR001) and Firing-In Buttress (SR002) be subdivided into separate MRSs, as follows, to facilitate cleanup or additional investigation.

11.4.1 Small Arms Range and Shooting-In Buttress (SR001)

Based on the results of CSE Phase II investigation, the Small Arms Range and Shooting-In Buttress (SR001) will require further munitions response action. Please see **Figure 11-1** for a map of the MRSs.

- Small Arms Range and Shooting-In Buttress (SR001) MRS – (Further munitions response action) – Approximately 1.9 acres.
- Small Arms Range and Shooting-In Buttress (SR001a) MRS – (No further munitions response action) – Approximately 1.8 acres.

As discussed in **Section 5.4**, the action level was reduced from 400 mg/kg to 261 mg/kg. The estimated soil removal volume at the 400 mg/kg action level is 1,251 cubic yards. The estimated soil removal volume at the 261 mg/kg action level is 1,675 cubic yards. The difference between the two estimated removal volumes is 424 cubic yards. It should be noted that the estimated removal volumes only include depths of contamination and do not include volumes for removal of the three berms. Removal volumes are only for the lead contaminated soil and do not include a remedial action for the 40-mm practice grenade debris.

11.4.2 Firing-In Buttress (SR002)

Based on the results of the CSE Phase II investigation, the Firing-In Buttress (SR002) will require further munitions response action. Please see **Figure 11-2** for a map of the MRSs.

- Firing-In Buttress (SR002) MRS – (Further munitions response action) – Approximately 0.1 acres.
- Firing-In Buttress (SR002a) MRS – (No further munitions response action) – Approximately 5.7 acres.

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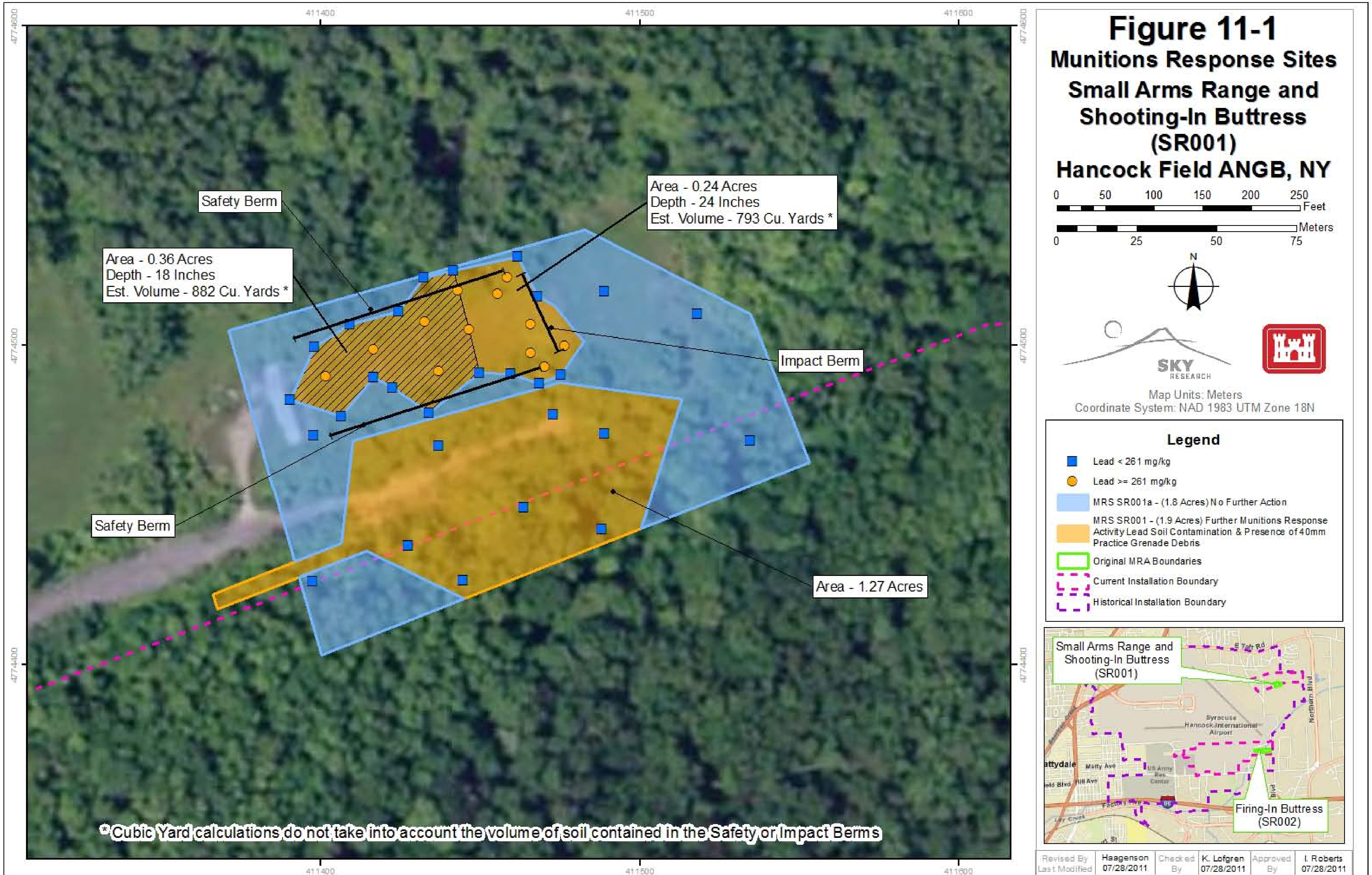
Figure 11-1
Munitions Response Sites
Small Arms Range and
Shooting-In Buttress
(SR001)
Hancock Field ANGB, NY
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
Lead < 261 mg/kg
Lead >= 261 mg/kg
MRS SR001a - (1.8 Acres) No Further Action
MRS SR001 - (1.9 Acres) Further Munitions Response Activity Lead Soil Contamination & Presence of 40mm Practice Grenade Debris
Original MRA Boundaries
Current Installation Boundary
Historical Installation Boundary
Safety Berm
Area - 0.36 Acres
Depth - 18 Inches
Est. Volume - 882 Cu. Yards *
Area - 0.24 Acres
Depth - 24 Inches
Est. Volume - 793 Cu. Yards *
Impact Berm
Safety Berm
Area - 1.27 Acres
*Cubic Yard calculations do not take into account the volume of soil contained in the Safety or Impact Berms
Small Arms Range and Shooting-In Buttress (SR001)
Firing-In Buttress (SR002)
Revised By Last Modified: Haagenson 07/28/2011
Checked By: K. Lofgren 07/28/2011
Approved By: I. Roberts 07/28/2011

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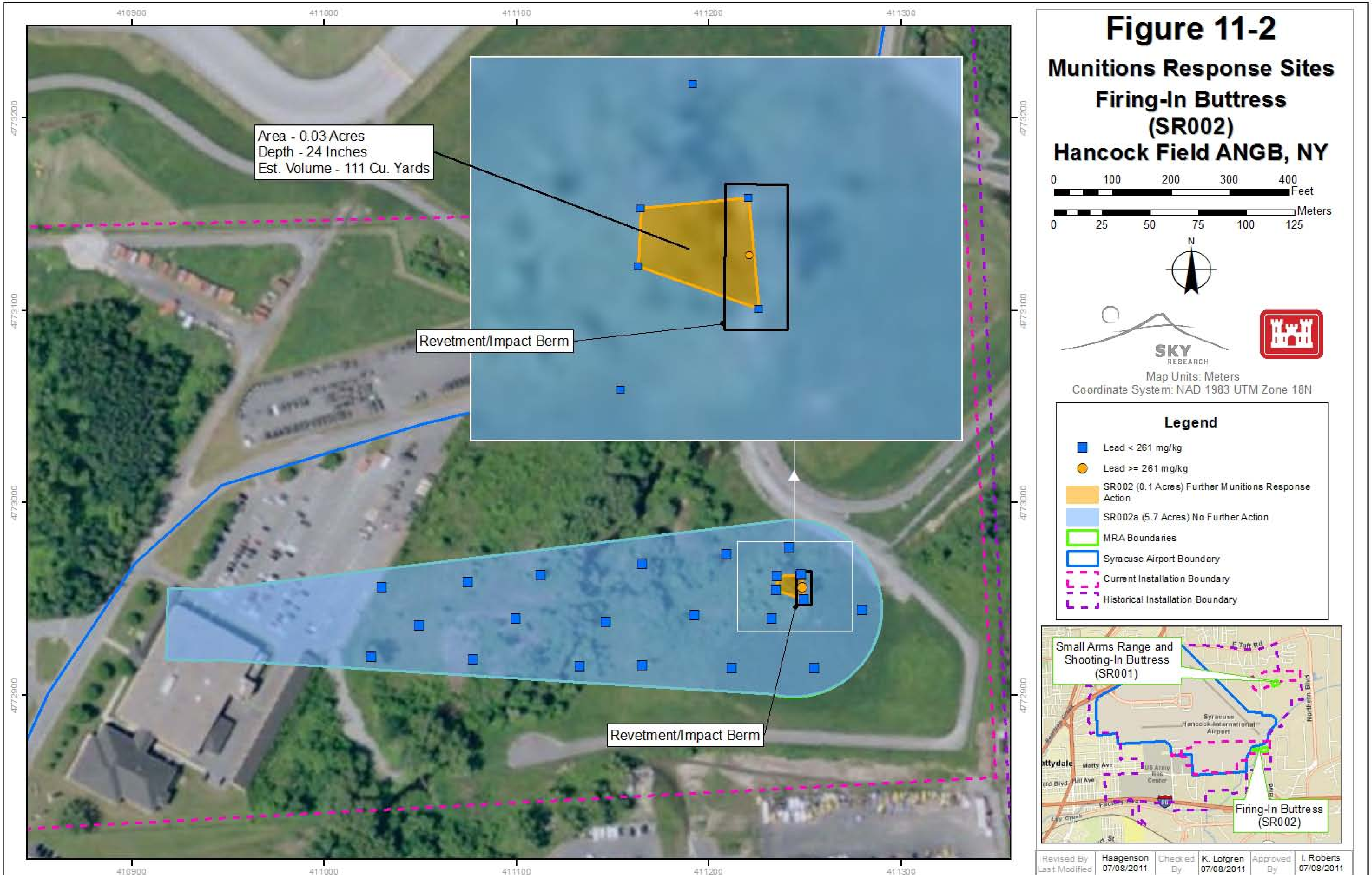
Figure 11-2
Munitions Response Sites
Firing-In Buttress
(SR002)
Hancock Field ANGB, NY
Area - 0.03 Acres
Depth - 24 Inches
Est. Volume - 111 Cu. Yards
Revetment/Impact Berm
Revetment/Impact Berm
Feet
Meters
Map Units: Meters
Coordinate System: NAD 1983 UTM Zone 18N
Legend
Lead < 261 mg/kg
Lead >= 261 mg/kg
SR002 (0.1 Acres) Further Munitions Response Action
SR002a (5.7 Acres) No Further Action
MRA Boundaries
Syracuse Airport Boundary
Current Installation Boundary
Historical Installation Boundary
Small Arms Range and Shooting-In Buttress (SR001)
Firing-In Buttress (SR002)
Revised By Last Modified
Haagenson 07/08/2011
Checked By
K. Lofgren 07/08/2011
Approved By
I. Roberts 07/08/2011

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12.0 Munitions Response Site Prioritization Protocol

This section discusses application of the MRSPP for the Hancock Field ANGB MRAs and MRSs. The DoD proposed the MRSPP (32 Code of Federal Regulations [CFR] Part 179) to assign a relative risk priority to each defense site in the MMRP Inventory for response activities. These response activities are based on the overall conditions at each MRA and MRS and consider various factors related to explosive safety and environmental hazards. The application of the MRSPP applies to all locations:

- That are or were owned, leased to, or otherwise possessed or used by the DoD.
- That are known to or are suspected of containing MEC or MC.
- That are included in the MMRP Inventory.

In assigning a relative priority for response activities, the DoD generally considers MRAs and MRSs posing the greatest hazard as being the highest priority. In the MMRP, the MRSPP priority will be one factor in determining the sequence in which munitions response actions are funded. The following sections are a summary of the working modules of the MRSPP. The MRSPP worksheet tables for the MRAs and MRSs at Hancock Field ANGB are included in **Appendix I**.

12.1 Explosive Hazard Evaluation Module

The EHE module assesses the presence of known or suspected explosive hazards. The EHE module is composed of three factors, each of which has two to four data elements intended to assess the specific conditions at an MRA or MRS. Based on site-specific information, each data element is assigned a numeric score. The sum of these values is the EHE module score that is used to determine the corresponding EHE module rating. The EHE factors are as follows:

- Explosive Hazard Factor: has the data elements *Munitions Type* and *Source of Hazard* and constitutes 40 percent of the EHE module score.
- Accessibility Factor: has the data elements *Location of Munitions*, *Ease of Access*, and *Status of Property* and constitutes 40 percent of the EHE module score.
- Receptors Factor: has the data elements Population Density, Population Near Hazard, Types of Activities/Structures, and Ecological and/or Cultural Resources and constitutes 20 percent of the EHE module score.

The EHE module worksheet tables are presented in **Appendix I** and summarized below in **Table 12-1**.

Table 12-1 Summary of the EHE Data Element Scores

Factors	Small Arms Range And Shooting-In Buttress Range (SR001)	Small Arms Range And Shooting-In Buttress Range (SR001a)	Firing-In Buttress (SR002)	Firing-In Buttress (SR002a)
Explosive Hazard Factor	11	11	40	3
Accessibility Factor	23	23	10	1
Receptor Factor	15	15	15	15
EHE Combination Level	49	49	65	19
Total EHE Module Rating	E	E	D	G

NH = No Known or Suspected Hazard.

12.2 Chemical Warfare Materiel Hazard Evaluation Module

The CHE module provides an evaluation of the chemical hazards associated with the physiological effects of CWM. The CHE module is used only when CWM in the form of MEC or MC are known or suspected of being present at an MRA or MRS. Like the EHE module, the CHE module has three factors, each of which has two to four data elements that are intended to assess the conditions at an MRA or MRS. These factors are as follows:

- CWM Hazard Factor: has the data elements CWM Configuration and Sources of CWM and constitutes 40 percent of the CHE score.
- Accessibility Factor: focuses on the potential for receptors to encounter CWM known or suspected to be present at an MRA. This factor consists of three data elements, Location of CWM, Ease of Access, and Status of Property and constitutes 40 percent of the CHE score.
- Receptor Factor: focuses on the human and ecological populations that may be impacted by the presence of CWM. It has the data elements Population Density, Population Near Hazard, Types of Activities/Structures, and Ecological and/or Cultural Resources.

Similar to the EHE module, each data element is assigned a numeric value, and the sum of these values is the CHE module score used to determine the corresponding CHE module rating. If CWM is not known or suspected, the CHE module rating is “No Known or Suspected CWM Hazard”.

The worksheet tables are presented in **Appendix I** and summarized in **Table 12-2.**

Table 12-2 Summary of the CHE Data Element Scores

Factors	Small Arms Range and Shooting-In Buttress (SR001)	Small Arms Range and Shooting-In Buttress (SR001a)	Firing-In Buttress (SR002)	Firing-In Buttress (SR002a)
CWM Hazard Factor	NH	NH	NH	NH
Accessibility Factor	NH	NH	NH	NH
Receptor Factor	NH	NH	NH	NH
CHE Combination Level	NH	NH	NH	NH
Total CHE Module Rating	NH	NH	NH	NH

NH = No Known or Suspected Hazard.

12.3 Health Hazard Evaluation Module

The HHE module provides a consistent DoD-wide approach for evaluating the relative risk to human health and the environment posed by contaminants (i.e., MC) present at an MRA. The module has three factors that are as follows:

- Contamination Hazard Factor (CHF): evaluates potential risk posed by contaminants and contributes a level of High (H), Medium (M), or Low (L) based on Significant, Moderate, or Minimal contaminants present, respectively.
- Migration Pathway Factor (MPF): assesses the potential for MC or incidental contaminants to migrate from an MRA or MRS and contributes a level of H, M, or L based on Evident, Potential or Confined pathways, respectively.
- Receptor Factor (RF): evaluates the presence of receptors who may be exposed and contributes a level of H, M, or L based on Identified, Potential, or Limited receptors, respectively.

The HHE builds on the DoD Relative Risk Site Evaluation (RRSE) framework that is used in the Installation Restoration Program (IRP). The CHF, RF, and MPF are based on a quantitative evaluation of MC and/or CERCLA hazardous substances, and a qualitative evaluation of pathways and human and ecological receptors in surface soil, groundwater, surface water, and sediment. The HHE does not address subsurface soil. In addition, the HHE does not consider air as a pathway because the risk through this medium from DoD MMRP sites with soil contamination is generally minimal.

The H, M, and L levels for the CHF, RF, and MPF are combined in a matrix to obtain composite three-letter combination levels that integrate considerations of all three factors. The three-letter combination levels are organized by frequency, and the combination of frequencies results in the HHE module rating.

The worksheet tables are presented in **Appendix I** and summarized in **Table 12-3**.

Table 12-3 Summary of the HHE Data Element Scores

Factors	Small Arms Range and Shooting-In Buttress (SR001)	Small Arms Range and Shooting-In Buttress (SR001a)	Firing-In Buttress (SR002)	Firing-In Buttress (SR002a)
Contaminant Hazard Factor	M	L	L	L
Migration Pathway Factor	M	L	L	L
Receptor Factor	M	L	L	L
HHE Combination Level	MMM	LLL	LLL	LLL
Total HHE Module Rating	D	G	G	G

NH – No Known or Suspected MC Hazard.
L – Low.
M - Medium.
H - High.

12.4 Munitions Response Site Prioritization Protocol Priority Scores

In accordance with the DoD MRSPP Primer (DoD, 2007), each MRA and MRS is assigned an MRSPP Priority ranging from 1 to 8 (**Table 12-4**). Priority 1 indicates the highest potential hazard and Priority 8 indicates the lowest potential hazard. Only a site with a chemical warfare hazard can receive an MRS Priority of 1. The MRSPP Priority is determined by selecting the highest rating from among the EHE, CHE, and HHE modules. For example, if the EHE rating is 2, the CHE rating is 5, and the HHE rating is 4, the MRSPP Priority assigned would be 2. The MRSPP Priority will be used to determine the future funding sequence of MRAs and MRSs for further munitions response actions.

Table 12-4 Priority Ratings for Hancock Field ANGB MRAs

Factors	Small Arms Range and Shooting-In Buttress (SR001)	Small Arms Range and Shooting-In Buttress (SR001a)	Firing-In Buttress (SR002)	Firing-In Buttress (SR002a)
EHE Module Rating	E (6)	E (6)	D(5)	G (8)
CHE Module Rating	NH	NH	NH	NH
HHE Module Rating	D (5)	G (8)	G(8)	G (8)
MRS Priority	**5**	**6**	**5**	**8**

NH - No Known or Suspected Hazard.

13.0 Recommendations

13.1 Recommendations

The recommendations for Small Arms Range and Shooting in Buttress (SR001) is further munitions response action due to lead contaminated soil and 40-mm practice grenade debris. The recommendation Firing-In Buttress (SR002) is further munitions response action due to lead contaminated soil. Recommendation for the remaining MRSs includes no further munitions response action. The CSE Phase II investigation results are all below human health and indicate no further munitions action is required for these sites.

A summary of the CSE Phase II results and potential future actions for the MRAs at Hancock Field ANGB are presented in **Table 13-1**.

Table 13-1 Conclusions and Potential Future Actions

MRA	CSE Phase II Conclusions	Potential Future Actions
Small Arms Range and Shooting-In Buttress (SR001)	**MEC Results:** No evidence of MEC identified **MC Results: There were 40** XRF samples collected and analyzed. Lead contents ranged from 25 mg/kg to 5217 mg/kg. **Human Health Risk Screening Results: There were** 8 soil samples that exhibited lead concentrations ranging from 630 mg/kg to 5217 mg/kg, exceeding the human health screening criteria of 400 mg/kg. There were 16 samples that exhibited lead concentrations ranging from 261 mg/kg to 5217 mg/kg, exceeding the modified action level of 261mg/kg. **Ecological Risk Screening Results:** Lead was at concentrations above the ecological screening level of 11 mg/kg. **MRSPP Priority Score:** 5	Further munitions response action
Small Arms Range and Shooting-In Buttress (SR001a)	**MEC Results:** No evidence of MEC identified **MC Results: There were 14** XRF samples were collected and analyzed. Lead contents ranged from 22 mg/kg to 199 mg/kg. **Human Health Risk Screening Results:** None of the samples exhibited lead concentrations exceeding the human health screening criteria of 400 mg/kg. No samples exceeded the modified action level of 261mg/kg. **Ecological Risk Screening Results:** Lead was at concentrations above the ecological screening level of 11 mg/kg. The mean lead concentration is above the 95th percentile of background for eastern U.S. soil. **MRSPP Priority Score:** 6	No further munitions response action

MRA	CSE Phase II Conclusions	Potential Future Actions
Firing-In Buttress (SR002)	**MEC Results:** No evidence of MEC identified **MC Results: There were 8** XRF samples collected and analyzed. Lead contents ranged from 24 mg/kg to 585 mg/kg. **Human Health Risk Screening Results: There were 2** soil samples that exhibited lead concentrations of 431 mg/kg and 585 mg/kg, exceeding the human health screening criteria of 400mg/kg. There were 3 that exhibited lead concentrations ranging from 368 mg/kg to 585 mg/kg, exceeding the modified action level of 261mg/kg. **Ecological Risk Screening Results:** Lead was at concentrations above the ecological screening level of 11 mg/kg. **MRSPP Priority Score:** 5	Further munitions response action
Firing-In Buttress (SR002a)	**MEC Results:** No evidence of MEC identified **MC Results: There were 18** XRF samples were collected and analyzed. Lead contents ranged from <LOD to 27 mg/kg. **Human Health Risk Screening Results:** None of the soil samples exhibited lead concentrations exceeding the human health screening criteria of 400mg/kg. No samples exceeded the modified action level of 261mg/kg. **Ecological Risk Screening Results:** Lead was at concentrations above the ecological screening level of 11 mg/kg. The mean lead concentration is less than the 95^{th} percentile of background for soils in eastern U.S. **MRSPP Priority Score:** 8	No further munitions response action

13.2 Identify Gaps in Conceptual Site Model

The CSMs for the Hancock Field ANGB MRAs are well defined. No gaps in the CSM were identified.

13.3 DoD MRSPP Priority

The DoD MRSPP Priorities for the Hancock Field ANGB MRSs are presented in **Table 13-1**. The scores range from 5 to 8. The overall priority for Hancock Field ANGB is 5.