



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7**

11201 Renner Boulevard
Lenexa, Kansas 66219

MEMORANDUM:

SUBJECT: Remedial Action Completion Report
Fort Riley, OU-8 MMRP Sherman Heights Small Arms Range
Fort Riley, Clay, Geary, Riley County, Kansas

FROM: Angela Sena, Remedial Project Manager
Federal Facility and Post Construction Section

THRU: William Gresham, Acting Section Chief
Federal Facility and Post Construction Section

TO: Tabatha Adkins, Chief
Site Remediation Branch

This memorandum documents the Remedial Action Completion Report (RACR) for the OU-8 MMRP Sherman Heights Small Arms Range. This Operable Unit (OU) encompasses the Sherman Heights Small Arms Range, between the Colyer Manor military housing complex and the Sherman Heights highlands. The area was used for a variety of munitions-related training activities including anti-aircraft, anti-tank ranges and small arms training dated back to the 1880s. A Remedial Investigation and Feasibility Study (RI/FS) was completed in 2011. A Proposed Plan was finalized in 2014 and a Record of Decision (ROD) was finalized in 2016. The contaminant of concern for this OU is lead. The ROD established a remediation goal (RG) of 400 milligrams per kilogram (mg/kg) for lead. The ROD selected the remedial alternative of land use controls (LUC) with long-term management. A component of the remedy is to conduct soil sampling every two years along the fencing perimeter. Groundwater sampling is to be conducted once every five years to ensure lead-contaminated soil is not impacting groundwater (leaching).

During the 2018 timeframe, the EPA reviewed the Draft Interim RACR and provided communication regarding the need for “restrictions on future land use” as stated in the ROD for OU8. The EPA stated that it cannot approve the RACR, for OU8 without all components of the remedy in place. Evaluation of composite soil sampling results for three areas with elevated lead concentrations and incorporating the next groundwater sampling event to occur in 2021 to incorporate results into the Fifth Five-Year Report scheduled for completion on September 28, 2022.

Based on the EPA’s request, the Fort Riley Environmental Division, Department of Public Works (DPW) integrated LUCs into the Fort Riley Camp Forsyth District Area Development Plan (formerly the Fort Riley Property Master Plan). In regards to the evaluation of the composite soil sampling results for the three elevated lead areas, the Army conducts the biennial soil sampling outside the fence-line surrounding the former range to ensure that soil containing lead that exceeds the RG of 400 mg/kg has not migrated off site; exposure to soil that contains lead concentrations that exceed the RG has been



prevented through maintaining fencing and signage; and groundwater monitoring will be performed every five years to ensure that lead in soil has not migrated into groundwater. The Army placed a fence and signage around the OU8 area and extended the fence on the western edge, incorporating the area defined by soil samples exceeding 400 mg/kg lead. This work was completed on September 19, 2022. The first groundwater sampling event was conducted in December 2021 with these results, along with the composite soil sampling results, being incorporated into the Fifth Five-Year Review. The above-described work completed the work outlined by the EPA as needed prior to approval of the RACR.

Attached for your approval is the now-approvable RACR, dated October 2018, for the Fort Riley OU8 Sherman Heights Small Arms Range. Pursuant to the Federal Facility Agreement (FFA), this is considered a primary document and meets the requirements for a Remedial Action Completion. As specified in the *Superfund Program Implementation Manual Fiscal Year 2022* dated April 2022, the Remedial Action Report is approved in writing by the Branch Chief documenting the completion of construction activities and signed by the Branch Chief.

Attachment

CERTIFICATION/APPROVAL PAGE
REMEDIAL ACTION COMPLETION REPORT
FOR THE
FORT RILEY, OU 8 MMRP SHERMAN HEIGHTS SMALL ARM RANGE
FORT RILEY, CLAY, GEARY, RILEY COUNTIES, KANSAS
EPA ID# KS6214020756

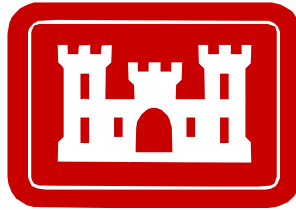
U.S. Environmental Protection Agency

Tabatha Adkins, Chief
Site Remediation Branch

Date

**FINAL
REMEDIAL ACTION COMPLETION REPORT SHERMAN
HEIGHTS SMALL ARMS RANGE (SHSAR) IMPACT
SLOPE
FORT RILEY, KANSAS**

Prepared for:



**U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, Nebraska 68102-4901**

Contract No. W9128F-16-D-0044

Task Order No: 0002

Prepared by:

**TEHAMA, LLC
1600 Genessee Street, Suite 754
Kansas City, MO 64102**

October 2018

**FINAL
REMEDIAL ACTION COMPLETION REPORT
SHERMAN HEIGHTS SMALL ARMS RANGE (SHSAR)
IMPACT SLOPE
FORT RILEY, KANSAS**

Prepared for:

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LIST OF ACRONYMS AND ABBREVIATIONS

Bay West	Bay West, LLC
Blixt	Blixt Construction, Inc.
Corvias	Corvias Military Housing
C&D	construction and demolition
DPW	Directorate of Public Works
DQCR	Daily Quality Control Report
ft	feet
GPS	global positioning system
KDHE	Kansas Department of Health and Environment
LTM	Long-term management
LUC	Land Use Controls
LUCIP	Land Use Control and Implementation Plan
MC	munitions constituents
MD	munitions debris
MEC	munitions explosives concern
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
MRA	Munitions Response Area
MRS	Munitions Response Site
MS	Matrix Spike
MSD	Matrix Spike Duplicate
msl	mean sea level
NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PP	Proposed Plan
QCSR	Quality Control Summary Report

RACR	Remedial Action Completion Report
RD/RA	Remedial Design/Remedial Action
RG	Remedial Goal
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RIP	Remedy in Place
RLS	Registered Land Surveyor
Rock Farm	Rock Farm Enterprises
ROD	Record of Decision
RSLs	Regional Screening Levels
RTK	real time kinematic
SHSAR	Sherman Heights Small Arms Range
SI	Site Inspection
Tehama	Tehama, LLC
Tri-City	Tri-City Fence Company, Inc.
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
ug/m ³	micrograms per cubic meter
XRF	X-Ray Fluorescence

**REMEDIAL ACTION COMPLETION REPORT
SHERMAN HEIGHTS SMALL ARMS RANGE (SHSAR) IMPACT SLOPE
FORT RILEY, KANSAS**

1.0 INTRODUCTION

Tehama, LLC (Tehama) has completed Remedial Design/Remedial Action (RD/RA) services for the Sherman Heights Small Arms Range (SHSAR) located at Ft. Riley, Kansas. Tehama completed these RD/RA services under contract with the U.S. Army Corps of Engineers (USACE) Omaha District. The primary objective was the establishment of Land Use Controls (LUCs), including institutional controls (public health education and restriction of future land use) and engineering controls (physical access restrictions) as specified in the Final Record of Decision (ROD), Revision 03, dated January 2016 (USACE, 2016).

All work was completed in accordance with the approved Remedial Design Plan prepared by Tehama dated September 20, 2017 (Tehama, 2017a).

2.0 SITE DESCRIPTION AND HISTORY

2.1 Background Information and Physical Setting

Fort Riley (CERCLIS ID #KS6214020756) is located in portions of Clay, Geary and Riley counties in north central Kansas (Figure 1). The Installation encompasses approximately 101,733 acres and lies 10 miles west of Manhattan, 50 miles west of Topeka, 135 miles west of Kansas City and 130 miles north-northeast of Wichita, Kansas. Fort Riley is located at the confluence of the Smoky Hill and Republican rivers, which combine to form the Kansas River. Portions of the Post are bounded by the cities of Riley, Junction City and Ogden, Kansas. Approximately 70,926 acres are used for maneuver training.

2.1.1 Location and Setting

The SHSAR Impact Slope Munitions Response Site (MRS) is located on Fort Riley near the southern Post boundary and consists of a steeply sloping ridge that rises from approximately 1,180 feet (ft) to 1,280 ft above mean sea level (msl). The SHSAR Impact Slope MRS is approximately 150 to 400 ft wide by 8,000 ft in length (52 acres) and is located between the Colyer Manor military family housing complex and the Sherman Heights highlands (Figure 1). The overall selected remedy for the property is to protect human health and environmental resources given the current and reasonably anticipated future land uses. The selected remedy for the SHSAR includes the implementation of LUCs and long-term monitoring. The ROD provided options for placement of fencing and suggestions for fence type and finish.

The Army is the lead agency for MRS activities, along with the support agencies including the United States Environmental Protection Agency (USEPA) and the Kansas Department of Health and Education (KDHE). As the lead agency, the Army will conduct and fund remedial activities and decisions at the MRS.

There are no wetlands within the SHSAR Impact Slope MRS. One overhead utility line transects (north-south) the MRS near the midpoint. Much of the area was developed into the Colyer Manor family residential housing complex, including the area to the north of Pistol Range Road. There are also recreational fields east of the housing complex. Areas formerly utilized as small arms ranges were identified in historical aerial photos in the Remedial Investigation/Feasibility Study (RI/FS) (Bay West, 2014).

Parts of Stokes mortars were identified and/or recovered from the SHSAR Impact Slope MRS during the Site Inspection (SI), therefore, the potential for munitions and explosives of concern (MEC) and munitions constituents (MC) existed. The location of the Stokes mortars found during the 2005 Military Munitions

Response Program (MMRP) SI fieldwork correspond to the location of the pre-WWII range depicted in a 1940 aerial photograph (e2M, 2006). Based on the findings of the SI, Fort Riley did not deem it necessary to restrict access. In addition, over 30 years of prescribed burning, wildfires, construction and training have not indicated high potential for surface explosives at SHSAR Impact Slope MRS.

2.1.2 Physical Setting

Surface Topography

Three types of physiographic areas are found at Fort Riley. They are high upland tall grass prairies, alluvial bottomland floodplains, and broken and hilly transition zones. Alternating layers of Permian-aged limestone and shale dominate the uplands. The softer shale units eroded at a significantly faster rate than the more resistant limestone escarpments, which form the broken and hilly transition areas of the central and east portions of the Post.

The cutting action of the streams on the thick shale units has sculpted much of the area into a rolling plateau. Fort Riley is composed of two types of alluvial bottomlands: wide meandering floodplains of major rivers with associated terraces, and areas created by smaller creeks and streams that cut the uplands (BMcD, 2001).

Geology

Fort Riley is underlain by bedrock of Pennsylvanian (in deeper subsurface) and Permian age. The bedrock is composed of the Chase Group (Upper Permian), which is exposed at the ground surface in many areas or covered by a thin mantle of loess (wind-blown silts). Older Permian rocks of the Council Grove Group are limited to the southeastern portion of Fort Riley. The Permian bedrock units consist of alternating layers of shale and limestone. The Barneston and Winfield Formations underlie most of the Post, and both units contain limestone and shale members. The more prominent bedrock outcrops at Fort Riley are composed of the Fort Riley Limestone Member of the Barneston Limestone which, due to its 30-ft thickness and chert-free character, is resistant to erosion. The Barneston Limestone Formation is visible in many stream banks as white, wall-like exposures.

The Fort Riley Limestone is prominent as the rim rock outcrop that has a wall-like appearance near the top of the bluff lines. The overall thickness of the Fort Riley Limestone Member is typically 30-45 ft and is a massive- to thin-bedded limestone with minor basal shale planes evident in the bedrock.

Quaternary-aged alluvial sand and gravel deposits are present in river floodplains. The alluvial deposits of the Republican River consist of clay, silt and sand near the surface and coarser sands and gravel at depth. The alluvial deposits are underlain by limestones and shales.

Hydrogeology

Surface waters on Fort Riley are within the Kansas River and Republican River drainage basins. Intermittent and perennial creeks, ponds, lakes and rivers are represented at Fort Riley. Significant surface water bodies located within one mile of the site include the Republican River located approximately 0.25 miles to the south, and Moon Lake located approximately 0.25 miles to the east/northeast. A drinking water plant and associated lime sludge monofill are located immediately north of Sherman Heights. There are no wetland areas within or adjacent to the MRS.

Surface water runoff at Fort Riley runs to, and is drained by, the Republican River, Kansas River, Threemile Creek, Sevenmile Creek, Honey Creek, Wildcat Creek and numerous smaller tributaries. The Republican

River runs along the southern boundary of Fort Riley. The Colyer Manor housing area sits atop alluvial deposits associated with the river that extend to the toe of the adjacent SHSAR Impact Slope MRS.

Groundwater levels in the alluvial aquifer are affected primarily by the stage of the Republican River and, to a lesser extent, by the stage of tributaries, ponds and lakes, and by infiltration from precipitation. The correlation between Republican River stage and groundwater levels in the alluvial aquifer is strongest near the river and is weaker farther from the river.

2.1.3 Site History

The SHSAR Impact Slope MRS is part of the SHSAR Munitions Response Area (MRA). A 2005 Historical Records Review indicated that the SHSAR MRA was used for a variety of munitions-related training activities (including anti-aircraft and anti-tank ranges) dating back to the 1880s (e²M, 2006), in addition to small arms training.

As a result of stakeholder discussions, the SHSAR MRA was reconfigured. The SHSAR MRA was expanded and split into two MRS': the SHSAR Firing Points MRS (Fort Riley-001-R-01) and the SHSAR Impact Slope MRS (Fort Riley-001-R-02).

The SHSAR Impact Slope MRS was reportedly operational in the 1880s. Munitions-related activities were discontinued in 1946 except for a small arms range that remained in use until the late 1980s. The SHSAR Impact Slope MRS was used primarily as a practice firing range for small arms and machine guns. However, the SHSAR Impact Slope MRS also included a cluster of ranges for pistols, anti-aircraft, anti-tank, machine gun and mortars along Sherman Heights. Firing was to the north toward Sherman Heights, which rises in elevation by approximately 100 ft. The ranges covered approximately 198.93 acres and overlapped to form an arc-shaped area within the southern boundary of the Installation and north of the Republican River. Historical aerial photographs included in the RI/FS indicate that much of the former range area was developed into the Colyer Manor family residential housing complex, including areas to the north of Pistol Range Road. There are also recreational fields located to the east of the housing complex.

2.1.4 Environmental Investigation History/Summary of Existing Data

Between 1994 and 2011, three studies were performed at the SHSAR Impact Slope MRS that included field investigation for MEC and/or sample collection for environmental characterization. The studies and associated reports include the following:

- 1994 X-Ray Fluorescence (XRF) Survey and Confirmatory Sampling (OHM Corporation [OHM], 1994);
- 2005 Site Inspection (e²M, 2006); and
- 2010-2011 RI/FS (Bay West, 2014a).
- 2014 Proposed Plan (PP) (Bay West, 2014b)
- 2016 ROD (USACE, 2016)

Following the 1994 soil sampling, a lead-removal action was performed at the Colyer Manor housing district. Approximately 1,500 cubic yards of soil, with a highest measured concentration of 1,700 milligrams per kilogram (mg/kg), were removed to remediate lead levels to below the USEPA Residential Regional Screening Levels (RSL)/KDHE Tier 2 Standard of 400 mg/kg. The majority of this soil was south of the SHSAR Impact Slope MRS boundary. In addition, as part of the Remedial Investigation (RI), a full-coverage survey for MEC was completed. This included removal of items from the surface and subsurface soils and utilized the same methods as those employed for a removal action. The net effect of the

investigation was a removal action, therefore, a no further action determination for MEC was warranted (USACE, 2016).

The SHSAR Firing Points MRS (Fort Riley-001-R-01) was investigated and no MEC or munitions debris (MD) was identified within the revised boundaries. Soil samples collected did not exceed the KDHE Bureau of Environmental Remediation Tier 2 Standards or USEPA RSLs. Accordingly, the MRS was recommended for no further action at the conclusion of the SI (e2M, 2006).

In 2010-2011 an RI/FS was performed by Bay West, LLC (Bay West) and three MEC items were recovered during the intrusive investigation. In addition, 597 pounds of MD were recovered (Bay West, 2014a).

In 2014, an RI/FS (Bay West, 2014a) was developed to evaluate remedial options for soil contaminated with lead. In November 2014, the RI/FS and PP were made available to the public, and a public meeting was held on 1 December 2014. The PP identified the Preferred Alternative, “Land Use Controls” for soil at the SHSAR Impact Slope MRS (Bay West, 2014b).

2.1.5 Record of Decision

In 2016, a ROD (USACE, 2016) was developed to discuss the selected remedial option of “Land Use Controls” for soil at the SHSAR Impact Slope MRS. In January 2016, the 3rd and final revision of the ROD presented the decision summary for LUCs at the site, including the following:

- Public education initiatives involving distribution of information about lead exposure, educational activities and meetings with area stakeholders and adding data to the facility information repository
- Restricting physical access using physical barriers and signage notifying that lead-contaminated soil exists and access is restricted
- Restricting land use from public and commercial uses
- Conducting long-term management (LTM); performing soil sampling every two years, groundwater sampling every five years and inspection/maintenance of physical barrier annually

3.0 REMEDIAL ACTION

The selected remedy for SHSAR was described in the final ROD (USACE, 2016). The LUC components include public outreach, restricting physical access, restricting land use from public and commercial uses, and conducting LTM. The following sections describe each component in more detail.

The Installation wide Land Use Controls Implementation Plan (LUCIP) (Aerostar, 2015) will be updated to include the LUC components.

3.1 Public Outreach

Prior to the start of field activities, Tehama worked closely with Fort Riley Directorate of Public Works, Environmental Division and Housing, Public Affairs Office, and Corvias Military Housing (Corvias) to make adjacent residents and the general public aware of the project. Public outreach included preparation of educational pamphlets, a news article in the installation newspaper, and a Facebook posting. The educational pamphlets were prepared by Tehama and were distributed by Corvias, the company that manages the adjacent Colyer Manor Military Family Housing development located to the south of the SHSAR. The pamphlet included a summary of planned field activities, a schedule for completion, details about the SHSAR, contact information and other related information. In addition to the educational pamphlet, Fort Riley published an article in the 1st Infantry Division/Fort Riley News in July 2017, discussing the same information as the pamphlet. Corvias also posted a notice of upcoming construction

work at SHSAR on their Facebook page. The Installation wide LUCIP (Aerostar, 2015) will be updated to include this information.

3.2 Utility Locate

Prior to the start of any intrusive field activities, a utility locate was performed by Tehama. The locate was set up through Kansas One-Call and the ticket number was forwarded to the Fort Riley Service Order Desk. No utilities were identified in the work area and Fort Riley issued a “dig permit” for the project.

3.3 Survey

The fence placement surrounds the area of the highest detected lead contamination (> 400 mg/kg) identified during the 2014 RI/FS (Figure 2). The proposed fence placement location was surveyed and staked by Tehama’s Registered Land Surveyor (RLS) prior to vegetation clearance operations on August 2, 2017. The surveyor used a real-time kinematic (RTK)-global positioning system (GPS) and/or traditional total station surveying to complete this task. An initial survey marked out the fence corridor, approximately 20 ft wide, for vegetation removal. Once vegetation clearance was completed, a second survey was completed to identify fence lines and corners.

Surveying was completed using a 36-inch lath at each corner in addition to intermediate locations suitable for line-of-sight direction during construction. No offset from the proposed fence line was necessary. Staking occurred approximately one week prior to the start of fence installation.

3.4 Subcontractors

Subcontractors were a key part of the Tehama project team. Tehama led the project team and provided construction management oversight during on-site activities. Specialty subcontractors were utilized for vegetation clearance, fence installation, and grading.

Rock Farm Enterprises (Rock Farm) was responsible for vegetation clearance in the area of the fence corridor.

Tri-City Fence Company, Inc. (Tri-City) was Tehama’s primary subcontractor on this project and installed the chain link fencing. Tri-City is located in Manhattan, Kansas and has successfully completed various other fencing installation projects at Fort Riley. Associated Drilling, Inc. (Associated Drilling) was utilized by Tri-City for assistance with drilling of post holes in bedrock.

Blixt Construction, Inc. (Blixt) was responsible for the excavation and grading of a soil bench along the northern fence line.

3.5 Mobilization

Tehama, Rock Farm, and Tri-City began mobilizing equipment and personnel to the site during the week of October 2, 2017. Rock Farm mobilized their equipment and cleared vegetation for a staging area. Tri-City set up and placed temporary fence around the staging area; where fencing materials, skid-loaders, and utility vehicles were stored.

Blixt and Associated Drilling mobilized to the site during the week of October 16, 2017. Blixt Construction mobilized a track-mounted hydraulic excavator and skid loader. Associated Drilling mobilized a skid loader with a continuous flight auger attachment, an air rotary drill rig, and an air compressor to the site. A Photo Log of activities is provided in Appendix A.

3.6 Vegetation Clearance

Following surveying and staking of the fence corridor, vegetation removal was conducted by Rock Farm during the week of October 2, 2017. The vegetation clearance area measured approximately 20 ft wide and extended throughout the 3,800 ft fence corridor. Vegetation removal consisted of mowing/mulching accessible portions of the fence corridor using a track-mounted skid loader with a forestry head processor attachment. Small trees less than 5-inches in diameter were cut, mulched and chipped in place. Trees larger than 5-inches in diameter were transported off site in 40 cubic yard roll-off boxes. A total of six roll-off boxes were filled with tree debris and transported by Blixt to their construction and demolition (C&D) debris landfill located near Chapman, Kansas.

3.7 Excavation

To ensure the safety of personnel and equipment working on the northern fence line, it was determined that a small amount of excavation and grading of a soil bench would be necessary to allow access to the work area. Blixt began constructing the soil bench across the northern fence line during the week of October 16, 2017. The bench was completed using a hydraulic excavator followed by a skid loader to assist with finishing grading and clean up. The completed soil bench starts at the northwest corner of the fence corridor and extends approximately 1,000 ft to the east. The bench was graded to a width of approximately 12 ft, to allow access to construction equipment and for personnel to work safely while installing the fence. Cut/displaced soil generated during excavation was also utilized to construct the bench. The excavated soil was placed on the slope immediately down gradient of the cut and used as fill to create approximately half of the bench width.

3.8 Fence Installation

Approximately 3,800 linear ft of six-foot tall, nine-gauge chain-link fence was installed along the perimeter of the SHSAR. A Fence As-Built Location Map (Figure 2) showing the location of the fence is attached. As presented in the approved Work Plan, the fence line was shifted from the original fence line location included in the ROD. This was done to completely encircle the lead-contaminated soil in excess of the Remedial Goal (RG) that was identified during the RI. The shift in location included moving the perimeter fence laterally from west to east to capture additional areas with contaminated soil above the RG. The northern fence line was also shifted approximately 50 ft north to place the fence line on/above the Fort Riley Limestone outcrop. This shift was done to place the fence in a more stable location (free of limestone boulders), to decrease future maintenance issues and annual LTM costs, and to provide a more protective barrier to the lead contamination remaining at the site. Fencing specifications in the ROD identified a chain link fence with a black vinyl finish, however the area north of the Colyer Manor military family housing complex, including the SHSAR, is periodically burned. Controlled burns are routine on Fort Riley and are used to control woody vegetation and promote native grasses. According to the fence manufacturer and the fence installer, controlled burns would melt the vinyl coating from the chain link fabric, therefore, a traditional galvanized finish in accordance with standard fence specs provided by USACE and Fort Riley was installed (Tehama, 2017a).

Fence posts were equally spaced on 10-ft centers. Tri-City subcontracted Associated Drilling to complete drilling of post holes in bedrock along the northern fence line, as well as areas with rough terrain along the east and west side slopes. Post holes were dug 36-inches deep using a mechanical post-hole digger mounted on a skid loader in areas where competent bedrock was not encountered. When competent bedrock was encountered along the northern fence line, a TechnoDrill TD410 air rotary drill rig and an Ingersoll Rand XHP 750 air compressor were used to complete drilling of the post holes.

Tehama completed air monitoring in accordance with the approved work plan. Personal air monitoring for particulate lead was completed on two workers for the first two days of work. Air monitoring samples were shipped overnight to SGS Galson and analyzed for particulate lead by National Institute for Occupational Safety and Health (NIOSH) Method 7300/mod. Occupational Safety and Health Administration (OSHA) ID-125G; ICP/MS. The analytical data indicated that particulate lead was not detected in any of the samples collected.

When post hole digging was completed for a section of fencing, the terminal posts and selected line posts were set first and used as a guide to position all remaining line posts. Terminal posts were 2 3/8-inches outside diameter and line posts were 1 7/8-inches outside diameter. After posts were properly aligned and plumbed, a mixture of #3000 pre-mixed concrete was placed into the post holes. Terminal posts were braced and trussed to the nearest line post using 1 5/8-inch outside diameter pipes, 3/8-inch truss rods and 3/8-inch truss rod tighteners. Once all posts and bracing were installed, a 1 5/8-inch top railing was attached. Middle rods are 10-ft in length and attached to a terminal and the closest line post. The fittings for all rails and rods are made of galvanized steel.

Nine gauge galvanized steel chain link mesh measuring 72-inches tall was stretched out and attached using 9-gauge tie wire spaced every 24-inches along the top rail and every 15-inches on the posts. Once the fabric was installed, 7-gauge coil spring Class 4 tension wire was installed at the base of the fabric with 9-gauge galvanized steel hog rings. The hog rings were installed every 24-inches.

Terminal gate post holes were dug 48-inches deep, 10-inches in diameter and spaced 192-inches apart. Terminal gate posts are 4-inch outside diameter and were installed in concrete, following the same specification as the terminal and line fence posts. The frame of the gate was constructed of 1 7/8-inch Schedule 40 pipe with truss rods. The gate frame was braced and attached using galvanized steel fittings. The chain link fabric applied to the gate is the same as the line fence.

3.9 Sign Installation

Upon completion of fence installation, permanent signage displaying potential hazards and explaining restricted access was mounted along the fence perimeter. Signs were placed in designated locations on November 20, 2017. Photos of the signs are provided in the Photo Log found in Appendix A. Five 36-inch x 42-inch white, aluminum signs were installed with one next to the access gate and the others centered on each of the four sides of the fence. The aluminum signs have a white background and solid, black 3-inch letters stating:

“Unauthorized Personnel
KEEP OUT
Sherman Heights Small Arms Range Impact Slope
Munitions Response Site
No Digging, Dumping, or Driving
Environmental Division, Directorate of Public Works
785 239-3194”

Twenty 24-inch x 30-inch white, aluminum signs were installed equidistant along the fence, with seven installed along the north line, six along the south line, four along the east line, and three along the western fence line. The aluminum signs have a white background and solid, black 3-inch letters stating:

“Unauthorized Personnel
KEEP OUT”

3.10 Site Restoration and Seeding

Once fence and signage installation was completed, site restoration and seeding of disturbed areas was completed on November 21, 2017. Material staging areas and work areas within the fence corridor were regraded, as necessary, to remove any vehicle or equipment tracks. Disturbed areas were seeded with a blend of grasses and vegetative cover that are native to the area. The slope along the eastern fence line was a regular route for Tri-City vehicles during fence installation, and the area was significantly affected by the heavy traffic pattern. Therefore, two 8-ft x 112-ft erosion control mats were stretched and stapled down along the eastern fence line, to minimize erosion and run-off during precipitation events.

3.11 Demobilization

Upon completion of the fence installation and site restoration activities, all personnel and equipment were demobilized from the site on November 21, 2017.

4.0 LONG-TERM MANAGEMENT

LTM includes biennial soil sampling for lead, annual fence inspections and groundwater sampling every five years. Surface soil sampling will be performed to confirm that lead is not migrating downslope outside the boundaries of the site. The first round of soil sampling was completed by Tehama on November 28-29, 2017, and a total of 48 surface soil samples (40 parent samples, 4 duplicate, 2 matrix spike (MS) and 2 matrix spike duplicate (MSD)) were collected along the perimeter of the site. All samples were collected in accordance with the approved Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP).

Analytical results indicated detections of lead in all 40 parent samples and 4 duplicate samples. Analytical results indicated 3 detections above the RSL of 400 mg/kg for lead. Soil samples SHSAR/SP17/SSO1/0-0.5', SHSAR/SP38/SSO1/0-0.5', and SHSAR/SP39/SSO1/0-0.5' contained lead at concentrations of 462 mg/kg, 446 mg/kg, and 460 mg/kg, respectively.

Soil sample SHSAR/SP17/SSO1/0-0.5' was collected near the base of the slope, along the southern fence line, and soil samples SHSAR/SP38/SSO1/0-0.5' and SHSAR/SP39/SSO1/0-0.5' were collected on the side slope, along the western fence line. No soil samples were collected on the property managed by Corvias Military Housing located to the south of the SHSAR. Figure 3 identifies the sample locations and corresponding detections for samples above the RSL. Complete laboratory data results are detailed in a stand-alone LTM Summary Memo and Quality Control Summary Report (QCSR).

A fence inspection was performed on October 3, 2018 and included the following:

- Are posts firmly anchored and supported?
- Is fencing fabric and wire tight and secure?
- Are gates moving freely and without binding?
- Are signs readable and still located in their original location?

The fence inspection will be documented in a trip report that will include photographs of the site, completed field forms, and supporting figures. Groundwater sampling is anticipated to occur in 2022, with four samples being collected from four locations along the outer perimeter of the downslope portion of the remedy fence line.

4.1 Legal Restrictions on Future Land Use

Legal restrictions will be put into place to limit future use of the land from commercial and public uses. Fort Riley Environmental Division, Directorate of Public Works (DPW) will integrate institutional controls for SHSAR into the next iteration of the Fort Riley Real Property Master Plan (currently scheduled for

Spring 2019), effectively placing the area off limits. Institutional controls for the site also will be incorporated into the Forsyth Area Master Plan (to be completed in Fall 2018) that solidifies planning and development within the Camp Forsyth Cantonment, and site will be addressed during quarterly Space Management Board meetings.

In addition, Fort Riley conducts environmental reviews of construction projects and other Army Actions per the National Environmental Policy Act (NEPA) and Army Regulation 200-1 that provide guidance to the Army regarding NEPA implementation. Fort Riley uses the environmental review process as a "gate keeper" to prevent development or disturbance to Operable Units and other contaminated sites having undergone or are undergoing restoration. An Environmental Overlay resides on the Fort Riley Geographical Information System (GIS) platform as part of the NEPA review that shows the location of these sites. The NEPA process as employed by Fort Riley constitutes another institutional land use control to limit future use of the land from commercial and public uses.

5.0 SUMMARY

Remedial action activities were conducted between October 2, 2017 and November 21, 2017. Fence installation was completed on November 8, 2017 and site restoration was completed on November 21, 2017. In accordance with the approved work plan, a total of 3,800 linear feet of fencing was installed around the area enclosing the highest concentrations of lead contaminated soil at the SHSAR. All activities were documented in Daily Quality Control Reports (DQCRs), which are provided in Appendix B. A Photo Log of activities is provided in Appendix A.

Based on the three discrete sample locations (SP17, SP38, and SP39) which exceeded the remediation goal of 400 mg/kg listed in the ROD, additional sampling will be necessary to further characterize lead concentrations in the area of these sample locations. Proposed sampling protocol will follow the 2003 Superfund Lead-Contaminated Residential Sites Handbook (EPA, 2003a). Sampling will include completion of 5-point composite samples at the three locations with elevated lead concentrations; sieving twice, first with a No. 4 sieve to remove bulk debris, then with a No. 60 sieve to obtain the fine fraction; and, submitting the fine fraction material for laboratory analysis as recommended in the Technical Review Workgroup for Lead (TRW) Recommendations for Performing Human Health Risk Analyses on Small Arms Shooting Ranges (EPA, 2003b). Proposed sampling locations and procedures will be detailed in a work plan addendum and results will be provided in a follow-up technical memorandum.

6.0 REFERENCES

Aerostar, 2015. *Land Use Control Implementation Plan, Fort Riley, Junction City, Kansas*. Prepared for the U.S. Army Corps of Engineers, Omaha District. October.

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