DEPARTMENT OF THE ARMY
LONGHORN ARMY AMMUNITION PLANT
POST OFFICE BOX 220
RATCLIFF, AR 72951

September 24, 2018

DAIM-ODB-LO

Mr. Rich Mayer
U.S. Environmental Protection Agency (USEPA)
Federal Facilities Section R6
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Final, Record of Decision (ROD),
LHAAP-03, Former Waste Collection Pad, Building 722-P Paint Shop
Longhorn Army Ammunition Plant, Karnack, Texas, June 2018

Dear Mr. Mayer,

Please find attached two hard copies and one electronic copy (compact disk) of the LHAAP-03 Final Record of Decision, signed by the Army and EPA for your records.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at rose.m.zeiler.civ@mail.mil.

Sincerely,

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
A. Palmie, TCEQ, Austin (letter)
P. Bruckwicki, Caddo Lake NWR, TX (1 hard copy and 1 CD)
A. Williams, USACE, Tulsa District, OK (1 CD)
N. Smith, USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 hard copy and 1 CD for project files)
P. Srivastav, APTIM, Houston, TX

DEPARTMENT OF THE ARMY
LONGHORN ARMY AMMUNITION PLANT
POST OFFICE BOX 220
RATCLIFF, AR 72951

September 24, 2018

DAIM-ODB-LO

Ms. April Palmie
Texas Commission on Environmental Quality (TCEQ)
Superfund Section, MC-136
12100 Park 35 Circle, Bldg D
Austin, TX 78753

Re: Final, Record of Decision (ROD),
LHAAP-03, Former Waste Collection Pad, Building 722-P Paint Shop
Longhorn Army Ammunition Plant, Karnack, Texas, June 2018

Dear Ms. Palmie,

Please find attached one hard copy and one electronic copy (compact disk) of the LHAAP-03 Final Record of Decision, signed by the Army and EPA for your records.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at rose.m.zeiler.civ@mail.mil.

Sincerely,

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished (letter only):
R. Mayer, USEPA, Region 6, Dallas, TX
P. Bruckwicki, Caddo Lake NWR, TX
A. Williams, USACE, Tulsa District, OK
N. Smith, USAEC, San Antonio, TX
K. Nemmers, Bhate, Lakewood, CO
P. Srivastav, APTIM, Houston, TX

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 19, 2018

Mr. Thomas E. Lederle
Chief, ACSIM BRAC Division
2530 Crystal Drive, Room 5000
Taylor Bldg./NC3
Arlington, Virginia 22202

Re: Record of Decision for LHAAP-03, Former Waste Collection Pad, Building 722-P Paint Shop, Longhorn Army Ammunition Plant Federal Superfund Site TX6213820529 Karnack, Harrison County, Texas

Dear Mr. Lederle:

The Texas Commission on Environmental Quality (TCEQ) received the final Record of Decision (ROD) for LHAAP-03, Former Waste Collection Pad, Building 722-P Paint Shop, Longhorn Army Ammunition Plant Federal Superfund Site in Karnack, Texas on June 4, 2018. The TCEQ has completed the review of the above referenced document and concurs that the described action is appropriate.

Sincerely,

Stephanie Bergeron Perdue
Interim Executive Director

cc: Mr. Carl Edlund, P.E., Director, Superfund Division, U.S. Environmental Protection Agency, Region 6

FINAL
RECORD OF DECISION
LHAAP-03
FORMER WASTE COLLECTION PAD
BUILDING 722-P PAINT SHOP

FOR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared For:

U.S. Army Corps of Engineers

Prepared By:

1608 13th Avenue South, Suite 300
Birmingham, Alabama 35205

2500 CityWest Blvd, Suite 1700
Houston, Texas 77042

June 2018

FINAL
RECORD OF DECISION

LHAAP-03
FORMER WASTE COLLECTION PAD
BUILDING 722-P PAINT SHOP

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared For:

U.S. Army Corp of Engineers

Tulsa District

Prepared By:

Bhate Environment & Infrastructure
and
Aptim Federal Services, LLC

Contract No. W9128F-13-D-0012

Task Order No. W912BV17F0150

June 2018

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Acronyms and Abbreviations

AECOM	AECOM Technical Services, Inc.
ARAR	Applicable or Relevant and Appropriate Requirement
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
COC	contaminant of concern
CSM	Conceptual Site Model
ECP	Environmental Condition of Property
EE/CA	Engineering Evaluation/Cost Analysis
EPC	exposure point concentration
FFA	Federal Facility Agreement
HHRA	Human Health Risk Assessment
HI	hazard index
K_d	lead distribution coefficient
kg	kilograms
LHAAP	Longhorn Army Ammunition Plant
LUC	Land Use Control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MOA	Memorandum of Agreement
MSC	medium-specific concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
PW	present worth
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design

RFA	RCRA Facility Assessment
RG	remediation goal
RI/FFS	Remedial Investigation/Focused Feasibility Study
ROD	Record of Decision
RRS	risk reduction standard
SAM	Soil Attenuation Model
SVOC	semi-volatile organic compound
TAC	Texas Administrative Code
TNT	trinitrotoluene
TCEQ	Texas Commission on Environmental Quality
UCL	upper confidence limit
U.S.	United States
U.S. Army	U.S. Department of the Army
USAEHA	U.S. Army Environmental Hygiene Agency
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound

1 THE DECLARATION

1.1 Site Name and Location

Longhorn Army Ammunition Plant (LHAAP) -03 (Former Waste Collection Pad, Building 722-P Paint Shop) LHAAP, Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), United States (U.S.) Environmental Protection Agency (USEPA) Identification Number: TX6213820529.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the selected remedy for LHAAP-03 (Former Waste Collection Pad near Building 722-P Paint Shop), located at LHAAP in Karnack, Texas. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Code of Federal Regulations (CFR) Title 40 Section (§) 300.

The remedy selection is based on work completed and documented in the Administrative Record for the site, including:

- Baseline Human Health Risk and Screening Ecological Risk Assessment Report (Jacobs, 2003)
- Baseline Ecological Risk Assessment (BERA) Report (Shaw, 2007b)
- Site Investigation Report (Shaw, 2009)
- Remedial Investigation/Focused Feasibility Study (RI/FFS) Report (AECOM Technical Services, Inc. [AECOM], 2013a)
- Proposed Plan (AECOM, 2013b) for LHAAP-03

The U.S. Department of the Army (U.S. Army), the lead agency for LHAAP, has issued this document. The USEPA (Region 6) and the Texas Commission on Environmental Quality (TCEQ) are the regulatory agencies providing technical support, project review and comment, and oversight of the LHAAP cleanup program. Under 40 CFR § 300.430(f)(4)(iii), the U.S. Army, as the lead agency, and the USEPA, as the lead regulatory agency, have jointly selected the remedy. The TCEQ concurs with the selected remedy.

1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of the Selected Remedy

This ROD presents the final remedy for soil at LHAAP-03. Groundwater for LHAAP-03 is addressed as part of the remedy for LHAAP-35A(58). The final remedy is identified in the Proposed Plan (AECOM, 2013b) that has been reviewed and approved by the regulatory agencies and placed in the Administrative Record file for LHAAP. The final remedy addresses arsenic- and lead-contaminated soil that, based upon testing and modeling, have the potential to result in local

groundwater arsenic and lead concentrations in excess of their respective maximum contaminant levels (MCLs). The soil cleanup levels selected are protective of the groundwater for arsenic and lead. Arsenic and lead concentrations exceeding the soil cleanup levels will be removed as part of the selected remedy and the remaining arsenic and lead concentrations in soil do not pose an unacceptable direct contact risk to humans or ecological receptors at this site. Surface water runoff to surface water streams is not shown as a pathway for the site on the Conceptual Site Model on **Figure 2-5**, and there is no indication of concentrations at the surface that present an unacceptable risk to human or ecological receptors that could create a risk via that pathway. To address ecological risk, LHAAP-03 was grouped with several other sites as part of the Industrial Sub-Area. The BERA (Shaw, 2007b) concluded that no unacceptable risk was present in the Industrial Sub-Area, and therefore no further action is needed at LHAAP-03 for the protection of ecological receptors.

The target soil remediation area for LHAAP-03 is contained entirely within the boundaries of a larger site, LHAAP-35A(58). Because LHAAP-03 is small and entirely contained within LHAAP-35A(58) and its land use control (LUC) boundary, the management strategy is to address the LHAAP-03 groundwater remedy and LUCs as being indistinguishable from and included with the LHAAP-35A(58) remedy via an Explanation of Significant Differences for the LHAAP-35A(58) ROD.

Similarly, LHAAP-03 lies wholly within the LUC boundary of LHAAP-35A(58) and all LUCs, as well as the non-residential land use notification, applicable to LHAAP-35A(58) will be applicable to LHAAP-03 in the same way and to the same extent (USACE, 2010 and 2018). Therefore, the remedy selected in this ROD does not include any specific provisions for LUCs.

CERCLA Five-Year Reviews specific to LHAAP-03 will be implemented following completion of the soil remedy to evaluate whether the remedy remains protective of human health and the environment. CERCLA Five-Year Reviews for LHAAP-03 will be addressed as part of the remedial action for LHAAP-35A(58). All monitoring and reporting requirements associated with CERCLA five year reviews, will be met under LHAAP-35A(58).

For these reasons, excavation and offsite disposal of soil exceeding the site-specific remediation goals (RGs) for arsenic and lead within the LHAAP-03 is the only remedy component selected by this ROD. Once the areas have been excavated, verification sampling will be performed to confirm that the contaminated soil exceeding the site-specific RGs has been removed. Following remedial action, contaminant of concern (COC) concentrations will be reduced to achieve chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) (based on the commercial/industrial land use scenario). The selected remedy for LHAAP-03 protects groundwater by preventing migration of COCs into groundwater at concentrations that could possibly result in local exceedances of the MCLs for arsenic and lead.

The Remedial Design (RD) will include the specific remedy implementation details. Within 21 days of the issuance of the ROD, the U.S. Army will propose deadlines for completion of the RD/Remedial Action Work Plan (RAWP). The documents will be prepared and submitted to the USEPA and the TCEQ pursuant to the Federal Facility Agreement (FFA).

1.5 Statutory Determinations

The final selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial

action, and is cost-effective. This remedy utilizes permanent solutions technologies to the maximum extent practicable. The remedy does not satisfy the statutory preference for treatment as a principal element of the remedy since the estimated quantity of soil to be removed is too small and the chemical concentrations too low to be economically treated. Although the selected remedy does not employ treatment, the potential threat to underlying groundwater will be eliminated because the soil will be excavated and disposed off-site.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this site.

- Current and reasonably anticipated future land use assumptions and current and potential future land use as identified in the baseline risk assessment and ROD (**Section 2.6**).
- Potential land use that will be available at the site as a result of the selected remedy (**Section 2.12**).
- COCs and their concentrations (**Section 2.5**).
- Baseline risk represented by the COCs (**Section 2.7**).
- Cleanup level established for the COCs and the basis for the levels (**Section 2.8**).
- This ROD does not describe how source materials constituting principal threats will be addressed, since wastes identified at LHAAP-03 do not meet the definition of principal threat waste.
- Key factor(s) that led to selecting the remedy (**Section 2.10**).
- Estimated capital and total present worth (PW) costs, discount rate, and the number of years over which the remedy cost estimates are projected (**Section 2.12**).

1.7 Authorizing Signatures

As the lead agency, the U.S. Army issues this ROD for LHAAP-03 to document the final selected remedy. The undersigned is the appropriate approval authority for this decision.

Thomas E. Lederle
Chief BRAC Division, ACSIM
United States Army

31 MAY 2018
(Date)

The U.S. Environmental Protection Agency approves the final selected remedy as provided in the ROD for LHAAP-03.

Carl Edlund
Director
Superfund Division
U.S. Environmental Protection Agency, Region 6

August 10, 2018
(Date)

2 DECISION SUMMARY

2.1 Site Name, Location, and Description

LHAAP-03 (Former Waste Collection Pad, Building 722-P Paint Shop), LHAAP, Karnack, Texas

CERCLIS USEPA Identification Number: TX6213820529

Lead Agency: U.S. Army, Department of Defense

Lead Oversight Agency: USEPA Region 6

Support Agency: TCEQ

Source of Cleanup Money: U.S. Army, Department of Defense

Site Type: Industrial Facility

The former LHAAP is an inactive, government-owned, formerly contractor operated and maintained, Department of Defense facility located in central east Texas (see **Figure 2-1**) in the northeast corner of Harrison County. LHAAP is approximately 14 miles northeast of Marshall, Texas, and approximately 40 miles west of Shreveport, Louisiana. The installation occupies approximately 1,400 of its former 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. The facility can be accessed via State Highways 43 and 134.

LHAAP was placed on the Superfund National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination associated with the listing of LHAAP as a NPL site began in 1990. The U.S. Army, the USEPA, and the Texas Water Commission (now known as the TCEQ) entered into a CERCLA Section 120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property. The majority of LHAAP has been transferred from the U.S. Army to the (U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge.

LHAAP-03 is located approximately 50 feet to the west of former Building 722-P (**Figure 2-2**). LHAAP-03 was a waste collection site (originally identified as a16-foot by 15-foot area) outside of the paint shop at Building 722-P, which was at the Maintenance Shop Area located within the boundary of LHAAP-35A(58). Building 722-P was used for paint spraying and polyurethane spray coating of various items. Heavy metal-based primers, other waste paint, waste solvents and contaminated rags were collected in a 55-gallon drum on a gravel pad in an open-sided shed. Full drums were transferred to Building 31-W for disposal offsite. Building 722-P has been demolished. Potential site-related chemicals at LHAAP-03 were metals, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) (Plexus, 2005).

Previous descriptions of the wastes collected at LHAAP-03 near the Paint Shop (Building 722-P) included inventories of the types and quantities of wastes generated, including waste paint thinner and other non-halogenated solvents (95 kilograms [kg] in 1985 and 200 kg in 1986), and urethanes (606 kg in 1985 and 400 kg in 1986) (U.S. Army Environmental Hygiene Agency [USAEHA], 1987). Approximately 130 gallons of waste paint thinner was generated circa 1990 (Day & Zimmerman, 1991).

2.2 Site History and Enforcement Activities

2.2.1 LHAAP History

LHAAP was established in December 1941 with the primary mission of manufacturing trinitrotoluene (TNT). Production of TNT began at Plant 1 in October 1942 and continued through World War II until August 1945, when the facility was placed on standby status until February 1952. LHAAP facility was reactivated with the opening of Plant 2, where pyrotechnic ammunition, such as photoflash bombs, simulators, hand signals, and tracers for 40 millimeter ammunition, were produced until 1956.

In December 1954, a third facility, Plant 3, began production of solid-fuel rocket motors for tactical missiles. Rocket motor production at Plant 3 continued to be the primary operation at LHAAP until 1965 when Plant 2 was reactivated for the production of pyrotechnic and illuminating ammunition. In the years following the Vietnam Conflict, LHAAP continued to produce flares and other basic pyrotechnic or illuminating items for the U.S. Department of Defense inventory. From September 1988 to May 1991, LHAAP was also used for the static firing and elimination of Pershing I and II rocket motors in compliance with the Intermediate-Range Nuclear Force Treaty in effect between the U.S. and the former Union of Soviet Socialist Republics. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

2.2.2 LHAAP-03 History

2.2.2.1 Historical Site Activities

LHAAP-03 was a waste collection site outside of the former paint shop at Building 722-P. These waste collection activities are the potential sources of soil impact at LHAAP-03. LHAAP-03 was not listed on the NPL when LHAAP was initially added in 1990. However, due to releases of chemicals from operations at the facility, LHAAP-03 was added to the NPL by the FFA parties in 2011.

2.2.3 History of Investigative and CERCLA Enforcement Activities

As part of the Installation Restoration Program, the U.S. Army began an environmental investigation in 1976 at LHAAP followed by installation wide assessments/investigations that included a preliminary Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) completed in 1988 by the Texas Water Commission (Texas Water Commission, 1988). Waste at the various sites was characterized, but no samples were collected during the RFA. The RFA document can be found in Volume 2 of 2 in year 1988 of the Administrative Record. This RFA captured and referenced U.S. Army Environmental Hygiene Agency (USAEHA) information developed in 1987 as part of the RCRA permit application process, and as a continuation of the 1982 EPS contamination survey, where all solid waste management units at LHAAP were identified, described and evaluated (USAEHA, 1987). After the listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991.

LHAAP-03 was visually inspected as part of the RFA. The drum was found in good condition and no evidence of spillage or leakage was found during the visual inspection. The visual

inspection report further documented that because it is a well-managed unit, no further RFA action is recommended.

In addition to installation-wide investigations, several investigations were conducted specifically for LHAAP-03 to evaluate the nature and extent of soil and groundwater impacts at the site. These investigations have included multiple rounds of soil sampling and analyses, installation of a groundwater monitoring well, and groundwater sampling and analyses. The soil and groundwater investigation results were primarily summarized in the following reports issued for the Site:

- Final Site Investigation Report, LHAAP-03 (Waste Collection Pad Near Building 722-P, Paint Shop), Longhorn Army Ammunition Plant, Karnack, Texas (Shaw, 2009)
- Draft Engineering Evaluation and Cost Analysis, LHAAP-03 (Former Waste Collection Pad Near Building 722-P, Paint Shop), Longhorn Army Ammunition Plant, Karnack, Texas (Shaw, 2011)

The Draft Engineering Evaluation/Cost Analysis (EE/CA) Report summarized the human health and ecological risk assessments conducted for LHAAP-03. The Human Health Risk Assessment (HHRA) for LHAAP-03 was completed in 2003 (Jacobs, 2003) as part of the risk assessment for the larger site, LHAAP-35A(58), which encompasses LHAAP-03. The 2003 human health risk calculations were updated in the Draft EE/CA based on the investigation results at LHAAP-03. The ecological risk for LHAAP-03 was addressed as part of the installation-wide BERA completed in 2007 (Shaw, 2007b).

Following issuance of the Draft EE/CA Report, the U.S. Army in coordination with the TCEQ and the USEPA Region 6 determined to proceed with the cleanup at LHAAP-03 under the CERCLA remedial action authority (rather than removal action authority). Therefore, a RI/FFS Report was prepared in 2013 (AECOM, 2013a) to summarize the results of the previous environmental investigations, and to develop and evaluate remedial action alternatives to address potential risks to human health and the environment due to impacted soil at LHAAP-03.

Based on the detailed analysis of remedial alternatives documented in the RI/FFS report, a Proposed Plan was released for public comment that presented U.S. Army's preferred remedial alternative for impacted soil at LHAAP-03 (AECOM, 2013b). This preferred remedial alternative included excavation of arsenic- and lead-impacted soil, and disposal at an off-site disposal facility. This ROD is consistent with the Proposed Plan.

The VOC-impacted groundwater present at LHAAP-03 is unrelated to the activities performed at the site and is being addressed as part of the planned remedial action at LHAAP-35A(58). There is also a limited potential that arsenic in soil at LHAAP-03 is leading to its MCL exceedance in groundwater at the site. The remedial action selected in this ROD will eliminate any current and/or potential for future leaching of arsenic into underlying groundwater at unacceptable concentrations at LHAAP-03.

2.3 Community Participation

The U.S. Army, the USEPA, the TCEQ and the LHAAP Restoration Advisory Board (RAB) have provided public outreach to the surrounding community concerning LHAAP-03 and other environmental sites at LHAAP. The outreach program has included fact sheets, site visits, invitations to attend quarterly RAB meetings, and public meetings consistent with its public participation responsibilities under Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of CERCLA.

The Proposed Plan (AECOM, 2013b) presenting the U.S. Army's preferred remedial action alternative for LHAAP-03 was made available to the public for review and comment on May 3, 2013. The notice of availability of the Proposed Plan and other related documents in the Administrative Record file was published in the *Marshall News Messenger* on May 12, 2013. The newspaper notice for the public meeting is provided in **Appendix A**. The public comment period for the Proposed Plan began on May 13, 2013, and ended June 12, 2013. A public meeting was held on May 30, 2013, in a formal format and with a court reporter. The transcript for the meeting is part of the Administrative Record. The significant comments (oral or written) are addressed in the Responsiveness Summary, which is included in this ROD as **Section 3.0**. The Administrative Record may be found locally at the information repository maintained at the following location:

Location: Marshall Public Library
300 S. Alamo
Marshall, Texas, 75670

Business Hours: Monday – Thursday, 10:00 a.m. – 8:00 p.m.
Friday – Saturday, 10:00 a.m. – 5:00 p.m.

2.4 Scope and Role of Response Action

This ROD selects the final remedy for arsenic and lead soil contamination at the LHAAP-03 site, which based upon testing and modeling, have the potential to result in local groundwater arsenic and lead concentrations in excess of their respective MCLs. Arsenic and lead in soil do not pose an unacceptable direct contact risk to humans (under an industrial scenario) or to ecological receptors. The role of the selected remedy is to prevent current and/or potential future migration of soil COCs arsenic and lead into groundwater. The selected remedial action includes soil excavation and off-site disposal to remove COC concentrations in soil to meet the RGs.

The target remediation area for LHAAP-03 lies entirely within the boundaries of a much larger site, LHAAP-35A(58).

The groundwater beneath LHAAP-03 is currently being addressed as part of the selected remedy for LHAAP-35A(58). Therefore, no separate remedial action for groundwater is required to address risks to human health and the environment.

2.5 Site Characteristics

This section of the ROD presents a brief yet comprehensive overview of LHAAP-03 site. The following elements of the Conceptual Site Model (CSM) are summarized in the subsections below: site physical characteristics, nature and extent of contamination, contaminant fate and transport, potential sources of contamination, potential release mechanisms, and potential exposure pathways. Detailed information about each element of the CSM can be found in the RI/FFS (AECOM, 2013a).

2.5.1 Physical Characteristics

2.5.1.1 Surface Water Hydrology

There are no surface water bodies present within LHAAP-03. Land at LHAAP-03 is relatively flat but water from heavy rains would eventually drain to the southern branch of Goose Prairie

Creek, approximately 800 feet to the southwest (see **Figure 2-2**). Goose Prairie Creek flows into Caddo Lake, although Goose Prairie Creek along with most surface water bodies at LHAAP have been impacted by drought conditions and are currently dry. Caddo Lake is a part of Big Cypress Bayou and is considered a wetland of international significance.

2.5.1.2 Geology and Hydrogeology

The subsurface geology at LHAAP consists primarily of a thin veneer of Quaternary alluvium overlying Tertiary age formations of the Wilcox and Midway Groups. The Wilcox Group underlies most of the LHAAP installation (Jacobs, 2002). The thickness of the Wilcox Group varies from 350 feet in the northwest corner of the installation to 130 feet along the eastern side near Caddo Lake. This formation consists of interbedded fine-to medium-grained sand, silt, and clay. The shallow soils at LHAAP-03 include interbedded layers of silty clays and sands (Shaw, 2007a).

2.5.2 Nature and Extent of Contamination

Groundwater generally occurs under semi-confined conditions at LHAAP. Perched and localized confining conditions frequently occur within the Wilcox Group deposits due to a high clay content and highly variable stratigraphy. The depth to groundwater across the LHAAP facility varies with typical depths being 12 to 16 feet below ground surface (bgs) in the shallow zone. Groundwater has been encountered at depths deeper than 16 feet bgs at certain locations within the LHAAP facility and groundwater levels have been impacted by on-going drought conditions. Depth to groundwater at monitoring well 03WW01 at LHAAP-03 was measured three times, in 2008 and 2011, with a depth to water of approximately 25 feet each time**.**

Groundwater contamination under LHAAP-03 is being addressed as part of the remedy for LHAAP-35A(58). A summary of the nature and extent of soil contamination at LHAAP-03 from the RI/FFS Report (AECOM, 2013a) is presented below.

Soil samples were collected from seventeen locations at LHAAP-03 soil operable unit at depths ranging from surface (0 to 0.5 feet bgs) to 15 feet bgs (**Figure 2-3**). The collected samples were analyzed for metals, VOCs, and SVOCs. The analytical results were compared to TCEQ risk reduction standard (RRS) 2 and RRS3 medium-specific concentrations (MSCs) (Title 30 Texas Administrative Code [TAC] Chapter 335) corresponding to commercial/ industrial land-use. The RRS2 and RRS3 MSCs are risk-based values developed to protect human health and groundwater resources, and are protective at a target risk level of 1×10^{-6} for carcinogens and a target hazard quotient of 1 for non-carcinogens.

No VOCs were detected at concentrations exceeding their respective RRS2 MSCs in any sample analyzed, and VOCs are of no further concern at LHAAP-03. Fifteen SVOCs had high sample detection limit concentrations identified for diluted samples and were not detected in any of the undiluted samples. Results of reanalysis of samples without dilution indicated that SVOCs were not detected in the soil at location 03SB01-1 (Shaw, 2009 and 2011).

Antimony, arsenic, barium, cadmium, chromium, copper, lead, and mercury were detected in one or more samples from borings 03SB01 through 03SB15, and 03SB17 at concentrations exceeding their respective RRS2 MSCs. These data indicated that there is a potential for the metals-contaminated soil to contaminate the groundwater (Shaw, 2009). Since LHAAP is under RRS3, to develop potential cleanup levels for the COCs in soil, RRS3 MSCs were developed using the soil

attenuation model, according to the TCEQ Risk Reduction Rules (30 TAC §335 and updates), included in the RI/FFS Appendix B (AECOM, 2013a). The RRS3 MSCs were developed for the following metals that exceeded their respective RRS2 MSCs: antimony, arsenic, barium, cadmium, chromium, copper, lead, and mercury.

The calculated 95 percent upper confidence limits (UCLs) of the mean concentrations in soil for antimony, arsenic, barium, cadmium, chromium, copper, lead, and mercury were compared to their respective calculated RRS3 MSCs. This comparison indicated that 95 percent UCLs for arsenic and lead exceeded their respective applicable RRS3 industrial soil MSCs and are the only COCs in soil. The maximum detected concentrations of arsenic and lead in soil were 32.7 and 6,760 milligrams per kilogram (mg/kg), respectively. The individual sample locations with lead and arsenic concentrations exceeding their respective RRS3 MSC values are shown on **Figure 2-4**.

LHAAP-03 groundwater is indistinguishable from LHAAP-35A (58) groundwater. The LHAAP-35A (58) groundwater levels are below the bottom of the ditch, and therefore, groundwater to surface water is not an identified pathway.

2.5.3 Contaminant Fate and Transport

Metals (arsenic and lead) exceeding their respective applicable RRS3 industrial soil MSCs were reported in a highly localized area (less than 50 feet by 50 feet) near the central portion of the site (see **Figure 2-4**). Within this localized area, metal concentration results from samples collected from boring 03SB04 and 03SB05, and 03SB07 and 03SB08 indicate that the distribution of elevated metal concentrations is heterogeneous.

LHAAP-03 is a localized area within a larger site, LHAAP-35A(58). The nearest surface water stream is approximately 800 feet from LHAAP-03. The runoff contribution from LHAAP-03 to nearby surface water bodies is expected to be negligible because of the small area of the site and unpaved areas surrounding the site. Overland flow does not currently appear to be contributing to a migration of contaminants, as the ditch surface water did not contain any VOCs, SVOCs, explosives, pesticides, or polychlorinated biphenyls. Surface water samples collected from the surface water ditch adjacent to LHAAP-03 as a part of the 2002 remedial investigation for LHAAP-35A(58) did not detect arsenic (Jacobs, 2002). Likewise, the sediment data do not show detections of VOCs, SVOCs, explosives, or pesticides. Some metals were detected in the surface water and sediment at low concentrations that naturally occur (USACE, 2010).

Leaching of metals in soil may occur into underlying shallow groundwater. The exceedance of arsenic in groundwater above its MCL is believed to be due to low dissolved oxygen in groundwater. Although it has not yet been determined if site chemicals are related to the arsenic groundwater exceedances, the remedial action selected in this ROD will eliminate any current leaching and/or the potential for future leaching of arsenic as well as lead into underlying groundwater.

2.5.4 Potential Exposure Pathways

The CSM and potential exposure pathways for LHAAP-03 based on the HHRA (Jacobs 2002), are shown on **Figure 2-5**. A hypothetical future maintenance worker was selected as the potential receptor in the risk assessment and the following exposure pathways were evaluated: incidental ingestion of soil, dermal contact with soil, and inhalation of vapors and particulates that have been released from soil.

2.6 Current and Potential Future Land and Resource Uses

2.6.1 Current and Future Land Uses

The reasonably anticipated future use of LHAAP-03 is as part of a national wildlife refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. That MOA documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge and will be used to facilitate a future transfer of LHAAP-03. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the 8,416-acre former installation. In accordance with the National Wildlife Refuge System Administration Act of 1966 and its amendments (16 U. S. Code 668dd), the land will remain as a national wildlife refuge unless there is a change brought about by an act of Congress, or the land is part of an exchange authorized by the Secretary of the Interior. Neither of these events terminating LHAAP-03's use as a wildlife refuge are reasonably foreseeable.

2.6.2 Current and Future Surface Water Uses

There is no surface water body present within LHAAP-03. Land at LHAAP-03 is relatively flat; water from heavy rains would eventually drain to the southern branch of Goose Prairie Creek, approximately 800 feet to the southwest. Goose Prairie Creek flows into Caddo Lake, a large recreational lake covering 51 square miles with a mean depth of 6 feet. The watershed of the lake encompasses approximately 2,700 square miles. Caddo Lake is used extensively for fishing and boating and provides drinking water supply to multiple cities/towns. The anticipated future uses of surface water are the same as the current uses.

2.6.3 Current and Future Groundwater Uses

Groundwater in the drinking water aquifer (250-430 feet bgs) under and near LHAAP is currently used as a drinking water source. The shallow, intermediate and deep zones are encountered at 10 to 25 feet bgs, 60 to 71 feet bgs, and 126 to 140 bgs, respectively. The shallow zone containing contaminated groundwater and the aquifer utilized for drinking water are considered distinct from each other with no connectivity. The drinking water aquifer should not be confused with LHAAP "deep zone" groundwater, which extends only to a depth of approximately 151 feet bgs. TCEQ identifies six active public water supply wells completed in the drinking water aquifer (**Figure 2-2**). All these public water supply wells are located greater than one mile from the LHAAP-03 site. Karnack Water Supply Corporation operates two source wells servicing the town of Karnack. These wells were completed in 1905 to depths of 287 and 285 feet bgs and are located hydraulically upgradient approximately one-quarter mile northwest and one-half mile southwest of the town center, respectively. Caddo Lake Water Supply Corporation operates three source wells located north and northwest of LHAAP that have been in use since 1905. These wells are hydraulically upgradient of LHAAP (Jacobs, 2002) with completion depths of 244, 185 and 310 feet below ground surface. Caddo Lake State Park operates one source well located approximately 1.6 miles northwest upgradient of LHAAP. This well was installed in 1905 with a total depth of 292 feet. Due to the large distance between these wells and LHAAP, water removal from these wells is not expected to affect groundwater flow at the site. In addition, there are several livestock and domestic wells located in the vicinity of LHAAP with depths averaging approximately 250 feet bgs.

Three water supply wells are located within the boundary of LHAAP itself (**Figure 2-2**). One well is located at the Fire Station with a total depth of 128 feet and a screened interval from 58 to 128 feet bgs; the second well is located upgradient/cross-gradient of LHAAP-03 approximately 0.35 miles southwest of the Fire Station. The third well is located north of the USFWS administration building for Caddo Lake National Wildlife Refuge, near the main entrance to LHAAP. None of these three wells are currently used for drinking water at LHAAP, although they may supply water for non-potable uses.

2.7 Summary of Site Risks

This section summarizes the results of the Baseline Human Health and Screening Ecological Risk Assessments (Jacobs, 2003) and the BERA conducted for LHAAP-03 (Shaw, 2007b).

2.7.1 Summary of Human Health Risk Assessment

A HHRA for LHAAP-03 was completed in 2003 (Jacobs, 2003) as part of the risk assessment for the larger Site, LHAAP-35A(58), which encompasses LHAAP-03. The 2003 HHRA was based on the data collected from investigations prior to 2001. Therefore, as part of preparation of the Draft EE/CA (Shaw, 2011), results from additional investigations conducted at LHAAP-03 subsequent to the 2003 HHRA were evaluated and risk calculations were updated. This included comparison of maximum detected concentrations in LHAAP-03 soil samples to the exposure point concentrations (EPCs) estimated during the 2003 HHRA. The original and revised cancer risk and non-cancer hazard index (HI) values for soil are summarized in **Table 2-1**.

The cancer risk values were compared to the USEPA target risk range of 1×10^{-4} to 1×10^{-6}, and the non-cancer hazards were compared to the target HI of 1. For the hypothetical future maintenance worker exposure to soil, the estimated HI is 0.47, which is below the benchmark of 1. The calculated carcinogenic risk is 2.1×10^{-5}, which is within the acceptable range (1×10^{-6} to 1×10^{-4}). While the EPCs for lead and arsenic did not exceed the industrial screening values for lead and arsenic, individual concentrations were present that exceeded direct contact based screening values and the SAM results (AECOM, 2013a) indicated that contaminants may leach to groundwater at concentrations exceeding the applicable standards.

2.7.2 Summary of Ecological Risk Assessment

The ecological risk for LHAAP-03 was addressed in the installation-wide BERA completed in 2007 (Shaw, 2007b). The BERA concluded that no unacceptable risk was present in the Industrial Sub-Area, where LHAAP-03 is located. Therefore, no further action is needed at LHAAP-03 for the protection of ecological receptors.

Data gap sampling is currently being conducted for explosives, and the results of this sampling will be incorporated into an addendum to the BERA. However, based on the historical use of the Maintenance Shop Area (the larger area within which LHAAP-03 is located), no change to the BERA conclusions are anticipated.

2.7.3 Basis for Action

Although the risks to human health due to soil contamination are within the acceptable industrial screening criteria range at LHAAP-03, remedial action is selected for soil to address the possibility of impacts to groundwater quality due to the presence of lead and arsenic in soil (see **Section 2.6.3**

for details). Based on the comparison of metal concentrations in soil with site-specific RRS3 MSC soil concentrations developed to protect groundwater resources from leaching of chemicals from soil and corresponding to a hypothetical use of groundwater under commercial/industrial land use scenario, the current concentrations of arsenic and lead in soil at LHAAP-03 are considered to have the potential to degrade groundwater quality in the local vicinity. Therefore, remedial action is selected at LHAAP-03 to address soil exhibiting concentrations of arsenic and lead above the RRS3 MCSs developed for the site.

2.8 Remedial Action Objectives

The Remedial Action Objective (RAO) for LHAAP-03, which addresses soil contamination and takes into account the future uses of LHAAP land and groundwater, is:

- Protect human health and the environment by preventing lead and arsenic contaminated soils from potentially leaching into the underlying groundwater.

NCP (40 CFR § 300.430 [e][2][i]) states that the RAOs must specify COCs and RGs. The COCs and RGs for soil at LHAAP-03 are presented in **Table 2-2**. The RGs for COCs have been set at concentrations equal to largest of calculated RRS3 industrial soil MSC based on the site-specific soil standard for groundwater protection, and background soil concentration. The details on the calculations for RRS3 industrial soil MSCs are presented in the RI/FFS (AECOM, 2013a).

2.9 Description of Alternatives

The following remedial alternatives were developed in the RI/FFS to address COCs in soil at LHAAP-03:

- Alternative 1: No Action
- Alternative 2: Excavation and Off-Site Disposal

Each of these alternatives is described in the following sections.

2.9.1 Alternative 1- No Action

As required by the NCP, the No Action alternative provides a comparative baseline against which the action alternatives can be evaluated. Under this alternative, soil would be left "as is," without implementing any containment, removal, treatment, or other mitigating actions. No other actions would be implemented to reduce existing or potential future exposure to human receptors.

There are no costs associated with the No Action alternative.

Estimated Total Direct Capital Cost: $0

Estimated Total Operation and Maintenance (O&M) Cost: $0

Cost Estimate Duration: NA

Estimated Total PW Cost: $0

2.9.2 Alternative 2 – Excavation and Off-Site Disposal

This Alternative is the preferred alternative and involves the Excavation and Off-Site disposal of contaminated soil from LHAAP-03. The conceptual limits of soil excavation at LHAAP-03 are shown on **Figure 2-6**. It is estimated that 50 to 100 bank cubic yards, of impacted soil will be

removed from LHAAP-03. The excavation extents shown on **Figure 2-6** may be revised as part of the pre-excavation sampling conducted prior to the start of excavation and confirmation sampling following soil removal. Confirmation samples collected following excavation will be analyzed for COCs (arsenic and lead) to evaluate if the RAOs/RGs (**Section 2.8**) have been attained. Once confirmation sampling results indicate that RAOs/RGs have been attained, the excavation areas will be backfilled with clean soil and reseeded.

All components of this action will use standard construction and operating procedures and routine sampling and analysis procedures. Details concerning operating procedures will be provided in a future design/work plan.

Implementation of this action may result in short-term impacts, such as minor fugitive dust emissions, storm-water runoff and precipitation/ infiltration in the excavation areas. These potential problems will be eliminated using appropriate engineering controls, such as water spraying, installing erosion and sediment control best management practices, and phased excavation areas or temporary sheeting.

A summary of cost estimate for Alternative 2 is provided below.

Estimated Total Direct Capital Cost: $87,878

Estimated Total O&M Cost:$0

Cost Estimate Duration: 1 year

Estimated Total PW Cost: $87,878

2.9.3 Expected Outcomes of Each Alternative

Alternative 1 would allow the site to remain a potential hazard to human receptors; and to the environment (i.e., groundwater), because no remedial activities would be conducted.

Alternative 2 provides removal of the contaminated soil to meet COC RGs protective of the groundwater underlying the site. Alternative 2 will protect human health by removing soil containing arsenic and lead at concentrations greater than the groundwater protection standards; at which point, LHAAP-03 will be available for its intended future use as a wildlife refuge.

2.10 Summary of Comparative Analysis of Alternatives

Nine criteria identified in the NCP §300.430(e)(9)(iii) are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. **Table 2-3** summarizes the comparative analysis of the alternatives.

2.10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how potential threat to groundwater quality due to leaching of COCs is eliminated through impacted soil removal.

The cancer and non-cancer risks due to soil contamination at LHAAP-03 are within the acceptable range for the potential human receptor/exposure pathways associated with the planned land use

(**Section 2.7.1**). In addition, the BERA concluded that no unacceptable risk to potential ecological receptors was present in the Industrial Sub-Area, where LHAAP-03 is located (**Section 2.7.2**). However, elevated metal concentrations in soil indicate the potential for contamination of groundwater in the future due to leaching from soil. Therefore, a remedy addressing the metal contamination in soil was selected to prevent potential impacts to the local groundwater resource.

The Excavation and Off-Site Disposal alternative is the most protective of groundwater. It involves the removal of impacted soil at LHAAP-03, and therefore is the only alternative that includes active cleanup of the site. This alternative meets the RAOs and is effective in preventing impacts to groundwater because contamination above the remedial goals is removed from the site. The No Action alternative involves no actions to prevent impacts to groundwater resources.

2.10.2 Compliance with ARARs

Section 121(d) of CERCLA and 40 CFR §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs" unless such ARARs are waived under CERCLA Section 121(d)(4). The ARARs that pertain to the selected remedy in this ROD are discussed in **Section 2.13.2**.

The No Action alternative does not meet the chemical-specific ARARs because soil contaminant levels that exceed groundwater protection criteria remain in the soil. Since no removal activities would be conducted under this alternative, location-specific and action-specific ARARs do not apply.

The Excavation and Off-Site Disposal alternative complies with ARARs. This alternative would meet the chemical-specific ARARs for soil (based on the commercial/industrial land use scenario) as well as comply with all location- and action-specific ARARs.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Over the long-term, the Excavation and Off-Site Disposal alternative would provide long-term effectiveness and permanence by eliminating the potential for migration of arsenic and lead from soil into groundwater at concentrations that may exceed their MCLs. The No Action alternative is not effective in the long term.

2.10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

The No Action alternative does not provide reduction of toxicity, mobility, or volume of the contaminants. The Excavation and Off-Site Disposal alternative provides reduction of mobility because COCs-impacted soil is removed from the site and placed in a permitted disposal facility. Toxicity and volume are not reduced by the Excavation and Off-Site Disposal alternative as the form and quantity of the contaminated soil is not altered.

2.10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until RGs are achieved.

Short-term effectiveness is not applicable to the No Action alternative. For the Excavation and Off-Site Disposal alternative, the use of proper dust suppressant measures would control windblown emissions of dust. Measures to protect the environment such as stormwater best management practices will be implemented, as required, as part of the Excavation and Off-Site Disposal alternative. Potential short-term risks to site workers due to soil excavation and onsite handling would be minimized through implementation of proper health and safety procedures.

The length of time required to complete the remedial alternatives are as follows: Alternative 1 is a No Action alternative, therefore, no time is required. The Excavation and Off-Site Disposal alternative, Alternative 2, has an estimated implementation duration of nine months.

2.10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

There are no technical or administrative feasibility concerns, or availability of services and materials concerns associated with the No Action alternative because there are no remedial actions performed.

There are no technical or administrative feasibility concerns, or availability of services and materials concerns associated with implementation of the Excavation and Off-Site Disposal alternative. Excavation and off-site disposal can be implemented using easily-procured equipment and services, and require only basic construction expertise.

2.10.7 Cost

Cost estimates are used in the CERCLA process to eliminate those remedial alternatives that are significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health or the environment. The cost estimates developed are preliminary estimates with an intended accuracy range of –30 to +50 percent. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

The cost estimates include capital costs (including fixed-price remedial construction) and long term O&M costs (post-remediation). PW costs were developed for each alternative assuming a discount rate of 2 percent.

The No Action alternative, which has no associated cost, is the least expensive alternative. The estimated net PW of Alternative 2 is $87,878 for a construction period of nine months to one year. These costs include capital cost for remedy implementation including Excavation and Off-Site disposal of soil.

2.10.8 State/Support Agency Acceptance

The USEPA and the TCEQ have reviewed the Proposed Plan, which presented Alternative 2 as the preferred alternative. Comments received from the USEPA and the TCEQ during the Proposed Plan development have been incorporated. TCEQ concurs with the selected remedial action. The lead oversight agency, USEPA, along with the lead agency, U.S. Army, have selected the remedy documented in this ROD.

2.10.9 Community Acceptance

Community acceptance is an important consideration in the final evaluation of the selected remedy. Public comments were received during the 30-day public comment period and during the May 30, 2013, public meeting. The written comments received and their responses are presented in the Responsiveness Summary (**Section 3.0**).

2.11 Principal Threat Waste

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should the exposure occur (USEPA, 1991). Soil at LHAAP-03 does not meet the definition of the principal threat waste because 1) the contaminants are not highly mobile and 2) under current and projected future non-residential use conditions, there is no unacceptable risk to human or ecological receptors from contact or ingestion of the soil. Therefore, this ROD does not describe how source materials constituting principal threats will be addressed.

2.12 The Selected Remedy

2.12.1 Summary of Rationale for the Selected Remedy

The U.S. Army has selected Alternative 2, Excavation and Off-Site Disposal as the final remedial action for contaminated soil at LHAAP-03 based on the results of the previous investigations (AECOM, 2013a), the administrative record for LHAAP-03, a comparative analysis of remedial alternatives (**Section 2.10**), and an evaluation of comments submitted by interested parties during the public comment period (**Section 3.0**).

As summarized in **Section 2.10**, based on the currently-available information, the U.S. Army believes that the selected alternative meets the threshold NCP evaluation criteria (Overall Protection of Human Health and the Environment, and Compliance with ARARs) and provides the best balance of tradeoffs among the other alternatives with respect to the balancing (Long-Term Effectiveness and Permanence; Reduction in Toxicity, Mobility, or Volume Through Treatment; Short-Term Effectiveness; Implementability; and Cost), and modifying (State/Support Agency Acceptance and Community Acceptance) criteria.

The selected alternative will (1) be protective of human health and the environment; (2) comply with ARARs; (3) is cost-effective; and (4) utilizes permanent solutions.

2.12.2 Description of the Selected Remedy

The description of the selected remedy, Alternative 2, outlined in **Section 2.9**, is expanded in this section. The remedy may undergo modifications as a result of the RD and construction processes. Modifications of the remedy described in the ROD will be documented using a technical

memorandum in the Administrative Record, an Explanation of Significant Differences, or a ROD amendment. The selected remedy is excavation and off-site disposal of soil at the LHAAP-03 soil operable unit. The selected remedy for LHAAP-03 is described in the following paragraphs.

Soil with concentrations of arsenic and lead exceeding the RGs presented in **Table 2-2** will be excavated and disposed of at an off-site disposal facility. The conceptual limits of soil excavation are shown on **Figure 2-6**. The proposed excavation depth within Area A is approximately two feet bgs; while the proposed excavation depth within Areas B and C is approximately seven feet bgs. The estimated volume of soil proposed to be removed from LHAAP-03 is 50 to 100 bank cubic yards.

The excavation extent shown on **Figure 2-6** will be refined as part of pre-excavation sampling conducted prior to the start of excavation. The pre-excavation sampling will include collection of soil samples and analyses for the arsenic and lead. The analytical results will be used to refine the initial excavation limits. The pre-excavation sampling results will also be used to plan confirmation sampling following excavation and to characterize the soil for disposal purposes.

Due to the limited excavation extent and depth, excavation will be performed using small capacity conventional equipment that is anticipated to include a small bulldozer and/or end loader to remove soil in the shallow excavation area and a rubber-tired or small tracked hydraulic excavator. Other equipment may include a water truck for dust suppression, end loader for moving and loading soil, dump trucks for transporting disposed soil and/or backfill soil delivery, roll-on/roll-off containers and trucks for transporting disposed soil.

Depending upon pre-excavation characterization, soil volumes, and logistics, the excavated soil may be directly loaded into roll off boxes or dump trucks, or stockpiled on-site prior to hauling off-site.

Because it is anticipated that the excavation will destroy monitoring well 03WW01, monitoring well 03WW01 will be abandoned in accordance with TAC, Title 16, §76.104. The portion of riser pipe and removable casing will be removed during excavation and disposed with the excavated soil. The proposed new monitoring well 35AWW23 will be used as replacement for 03WW01 for the groundwater remedy for LHAAP-35A(58).

Once the areas have been excavated to the planned depths, verification soil sampling will be performed to collect data to evaluate if RAOs/RGs have been attained. If the results of confirmation sampling indicate that the RAOs/RGs have not been attained, additional excavation may be conducted followed by an additional round of confirmation sampling.

Waste characterization for excavated soil and decontamination water (if any) will be conducted in accordance with the requirements of the disposal facility. Waste characterization may include collection of soil and/or water samples, and analyses for the chemicals expected to be present at the site based on the historical operations. The results of the waste characterization will be used to select appropriate disposal facility for excavated soil and decontamination water. The disposal facility will meet the requirements of CERCLA Offsite Rule (40 CFR § 300.440).

After it has been demonstrated that the RGs for arsenic and lead have been attained, the excavated areas will be backfilled with fill material and compacted. The backfilled areas will be seeded.

2.12.3 Cost Estimate for the Selected Remedy

Table 2-4 presents the cost estimate summary for the selected remedy. The information in the table is based on the best available information regarding the anticipated scope of the remedial alternative. The quantities used in the estimate are for estimating purposes only. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost.

The PW cost of the selected remedy is approximately $87,878. This cost includes capital cost for remedy implementation for the cost items listed in **Table 2-4**.

2.12.4 Expected Outcomes of Selected Remedy

The selected remedy includes removal of contaminated soil exceeding the RGs for COCs and disposal at an off-site facility. The RGs (**Table 2-2**) are developed to protect groundwater resource from potential leaching of COCs from soil. No unacceptable risks to human health or the environment were determined to be associated with LHAAP-03 soil based on the HHRA (for the proposed land use) or BERA. LHAAP-03 will be available for its intended future use as a wildlife refuge.

2.13 Statutory Determinations

Under CERCLA §121 and the NCP, the U.S. Army must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how the selected remedy meets the statutory requirements

2.13.1 Protection of Human Health and the Environment

The BERA results indicate that no further action is needed at LHAAP-03 for the protection of ecological receptors (see **Section 2.7.2** for details). The cancer and non-cancer risks due to soil contamination at LHAAP -03 are within the acceptable range for the potential human receptor/ exposure pathways associated with the planned land use.

The selected remedy is protective of groundwater and will remove the soil exceeding the RGs for the COCs, arsenic and lead (**Table 2-2**). The RGs are developed to protect groundwater resource from potential leaching of COCs from soil and correspond to potential use of groundwater under commercial/industrial uses (USACE, 2010). Because both arsenic and lead have federal MCLs, the site specific soil RGs are the same for residential and commercial/industrial land uses.

There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the remedy.

2.13.2 Compliance with ARARs

Section 121(d) of the CERCLA of 1980 (42 U.S.C. § 9621[d]), as amended, states that remedial actions on CERCLA sites must attain (or the ROD must justify the waiver of) any Federal or more

stringent State environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. The selected remedial action will comply with all identified ARARs.

CERCLA Section 121(e)(1), 42 U.S.C. § 9621(e)(1), states that "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section." Any action that takes place off-site would have to comply with substantive and procedural requirements of all applicable Federal, State, and local regulations. The chemical-, location-, and action-specific ARARs for the selected remedy are discussed in the following sections.

2.13.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. **Table 2-5** presents the State chemical-specific ARARs. No Federal chemical-specific ARARs were identified for the selected remedy.

The RGs for soil at LHAAP-03 comply with substantive provisions of the TCEQ Risk Reduction Rules at 30 TAC 335.563 (i)(2)(A) and (j)(1).

2.13.2.2 Location-Specific ARARs

There are no potential location-specific ARARs associated with this site.

2.13.2.3 Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site. Remedial activities associated with the selected remedy include activities that have the potential to generate air contaminants, particulate matter, and hazardous waste. **Table 2-6** discusses action-specific ARARs.

The selected remedy has potential action-specific ARARs related to the following activities:

- **General Site Preparation, Excavation, Grading, and Backfilling Activities** – Fugitive dust may be generated during the land-disturbing, earth-moving, and grading operations. Therefore, the requirements at Title 30 TAC (30 TAC 111.111(a)(8)(A) for controlling visible emissions are applicable to the remedial action. All excavation is expected to be performed above groundwater table, therefore, no groundwater treatment is expected. In the event of rainfall, if significant quantities of water accumulate in the impacted areas (exceeding RGs), the water will be collected, managed and stored in accordance with the requirements presented below.
- **Waste Generation, Management, and Storage –** The excavated soil and other wastes (such as decontamination water) will be generated during the remedial action. The determination of whether wastes generated during remedial action are hazardous will be made in accordance with the requirements of 40 CFR 262.11, 264.13(a)(1) and (2); and 30 TAC 335.62, 335.503(a)(4), 335.504, 335.509, and 335.511. Excavated waste classified as RCRA hazardous waste will be accumulated in accordance with 40 CFR 264.34(a) and

(c)(1) (for accumulation in containers) and/or 40 C.F.R. § 264.554(d)(1)(i-ii) and (d)(2), (e), (f), (h), (i), (j), and (k) (for accumulation in staging piles). The container storage will be in compliance with 40 CFR 264.171-173; and 30 TAC 335.69(e) and 335.152(a)(7). At closure, storage containers will be decontaminated in accordance with 40 CFR 264.178 and 30 TAC 335.152(a)(7). Since any characteristic hazardous waste will be stored in either containers or staging piles in compliance with the identified ARARs, the land disposal restrictions would not be triggered.

2.13.3 Cost-Effectiveness

Alternative 2, the selected remedy for LHAAP-03 has been determined to provide overall effectiveness proportional to its costs; it is therefore considered cost-effective. The estimated net PW cost for this remedial action is approximately $87,878. Technologies included in this remedy are readily implementable and have been widely used and demonstrated to be effective.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The U.S. Army has determined that the selected final remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. The selected remedy provides the best balance of tradeoffs with respect to the balancing NCP criteria. The selected remedy is effective in the long-term since it will include removal and off-site disposal of soil that may pose a threat to groundwater quality. Although, no treatment is proposed for excavated soil due to limited volume, the removal of soil will reduce the potential for mobilization of metals on-site due to leaching from soil. The selected remedy is readily implementable and is cost-effective.

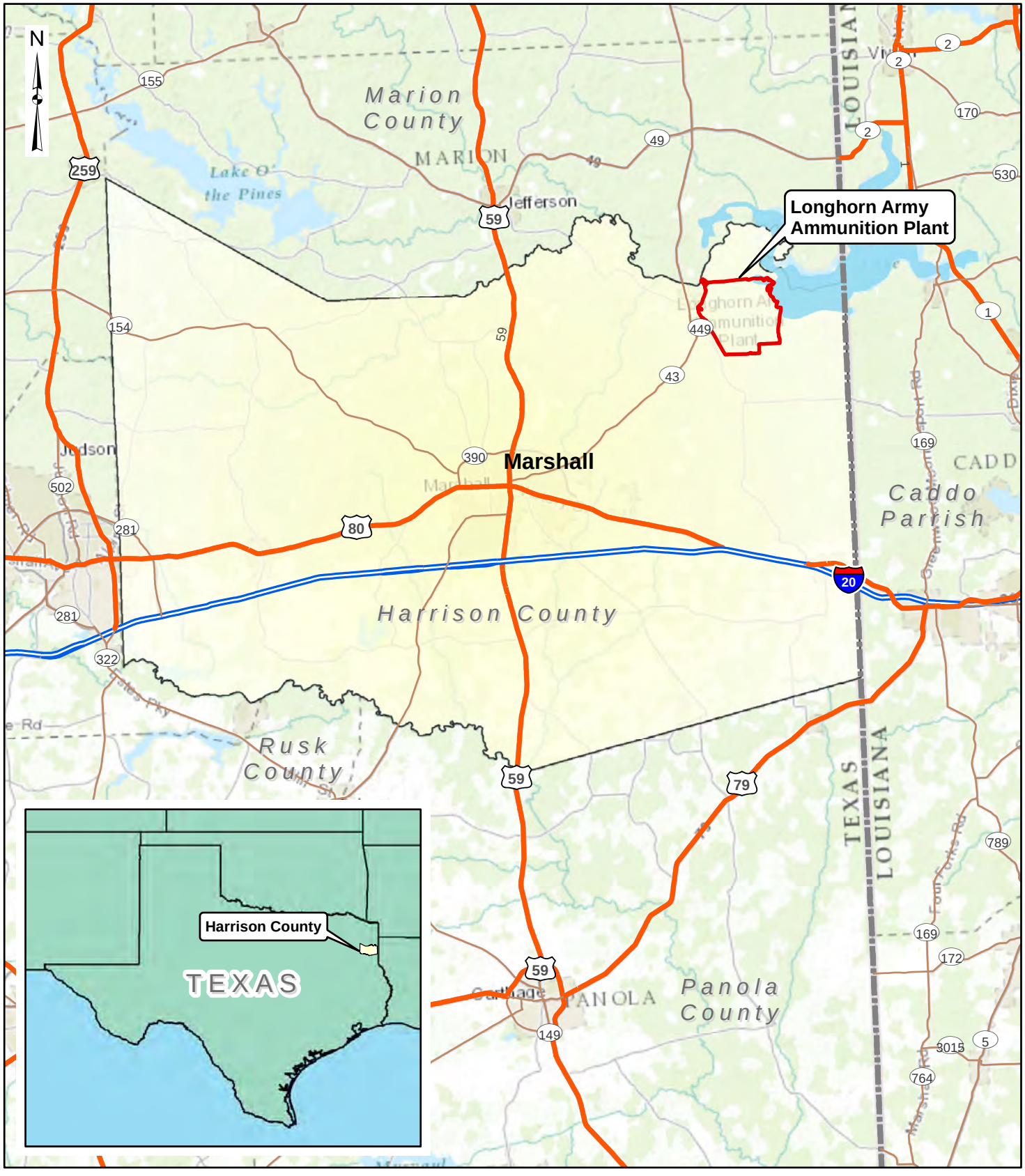
2.13.5 Preference for Treatment as a Principal Element

The CERCLA Section 121(b) identifies a statutory preference for alternatives that utilize treatment to reduce the toxicity, mobility, or volume of contamination. Although the selected remedy does not treat the contaminated soil to remove the COCs in LHAAP-03 soil, the contaminated soil will be removed from the site and transported to an appropriate off-site disposal facility. Excavation and removal of the contaminated soil from LHAAP-03 will reduce the volume of contaminants at the site.

During the development of alternatives in the Feasibility Study Addendum, treatment technologies were considered for soil at LHAAP-03 but were not retained for remedial alternative development due to the small volume and low chemical concentrations of the soil rendering these technologies ineffective either technically or based on cost-effectiveness.

2.14 Significant Changes from the Proposed Plan

The Proposed Plan public comment period for LHAAP-04 was from May 13, through June 12, 2013. The Proposed Plan identified Alternative 2 as the Preferred Alternative for soil remediation. The U.S. Army reviewed all written comments during the public comment period and verbal comments during the May 30, 2013 public meeting. After careful consideration of the comments, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.



LHAAP -- Longhorn Army Ammunition Plant

APTIM

Figure 2-1
LHAAP Location Map
LHAAP-03
Record of Decision
Longhorn Army Ammunition Plant
Karnack, Texas

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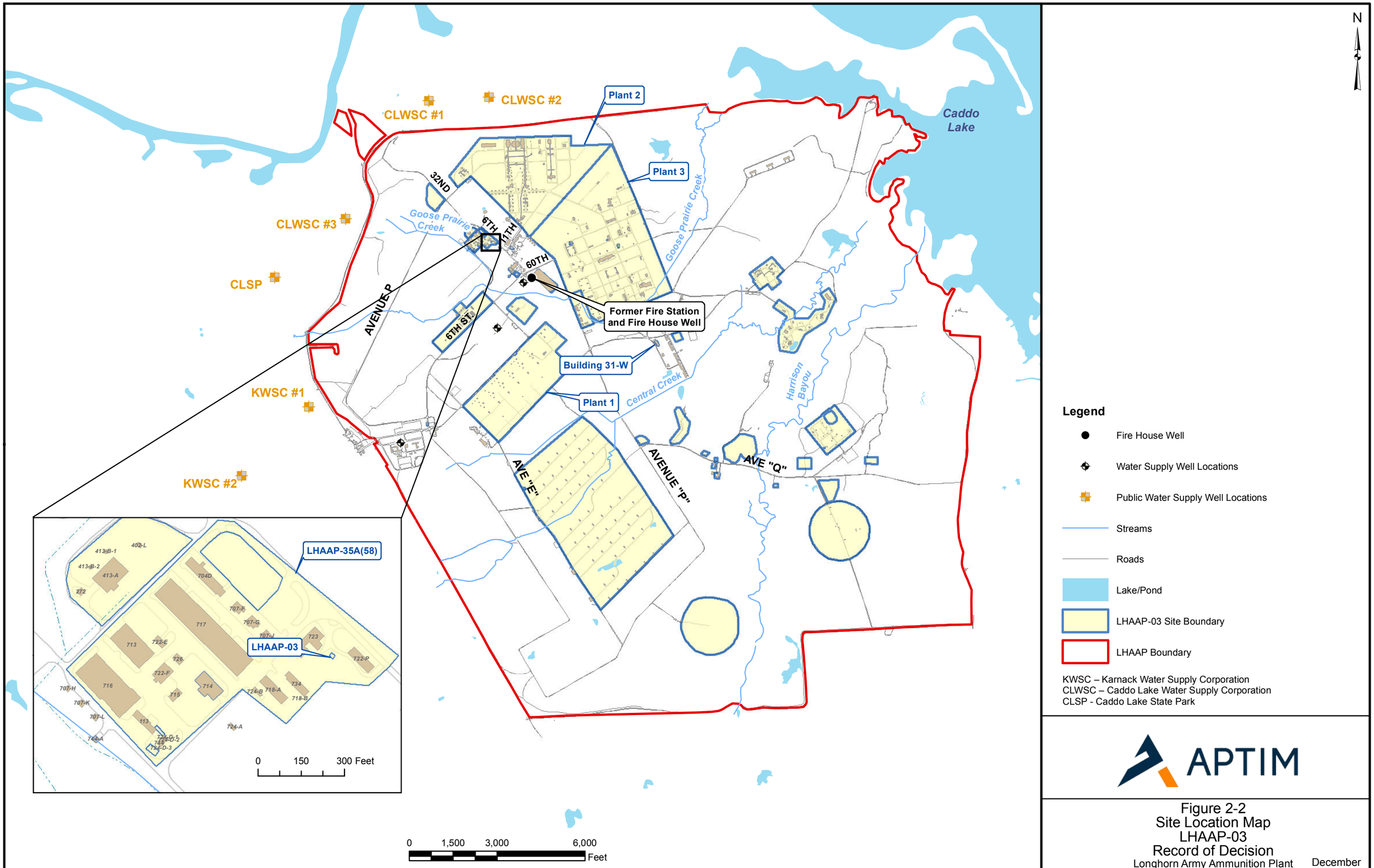
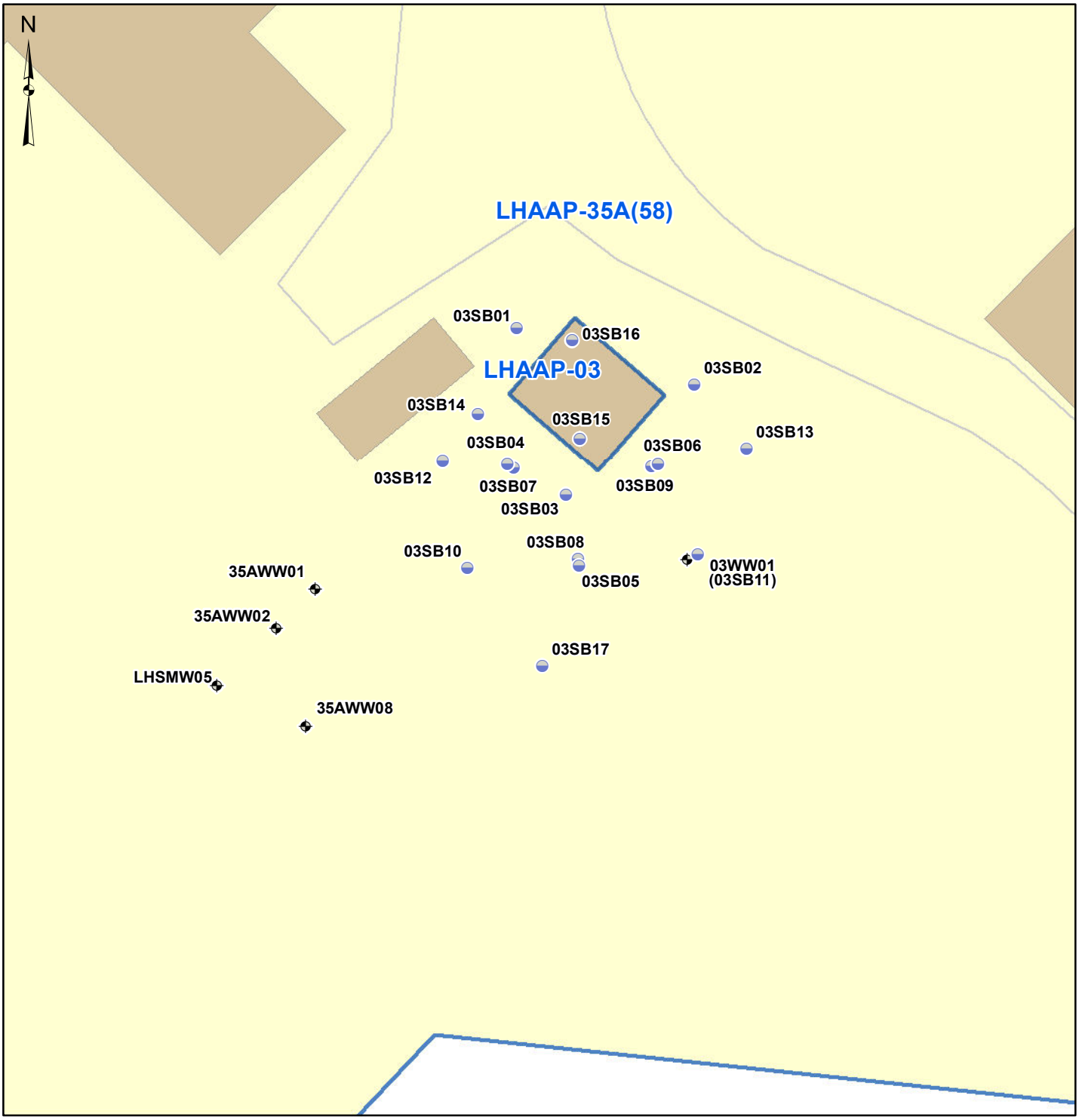
December 2017



\\usgrn1vfp001\data\group\L:\Group\IT_GIS\GIS Projects\Longhorn\MXDs\LHAAP-03\2013-May-16\Figure 2-2 LHAAP-03 Site Location Map_CH.mxd



Legend

- Monitoring Well Location
- Soil Boring Location
- Roads
- Buildings
- Site

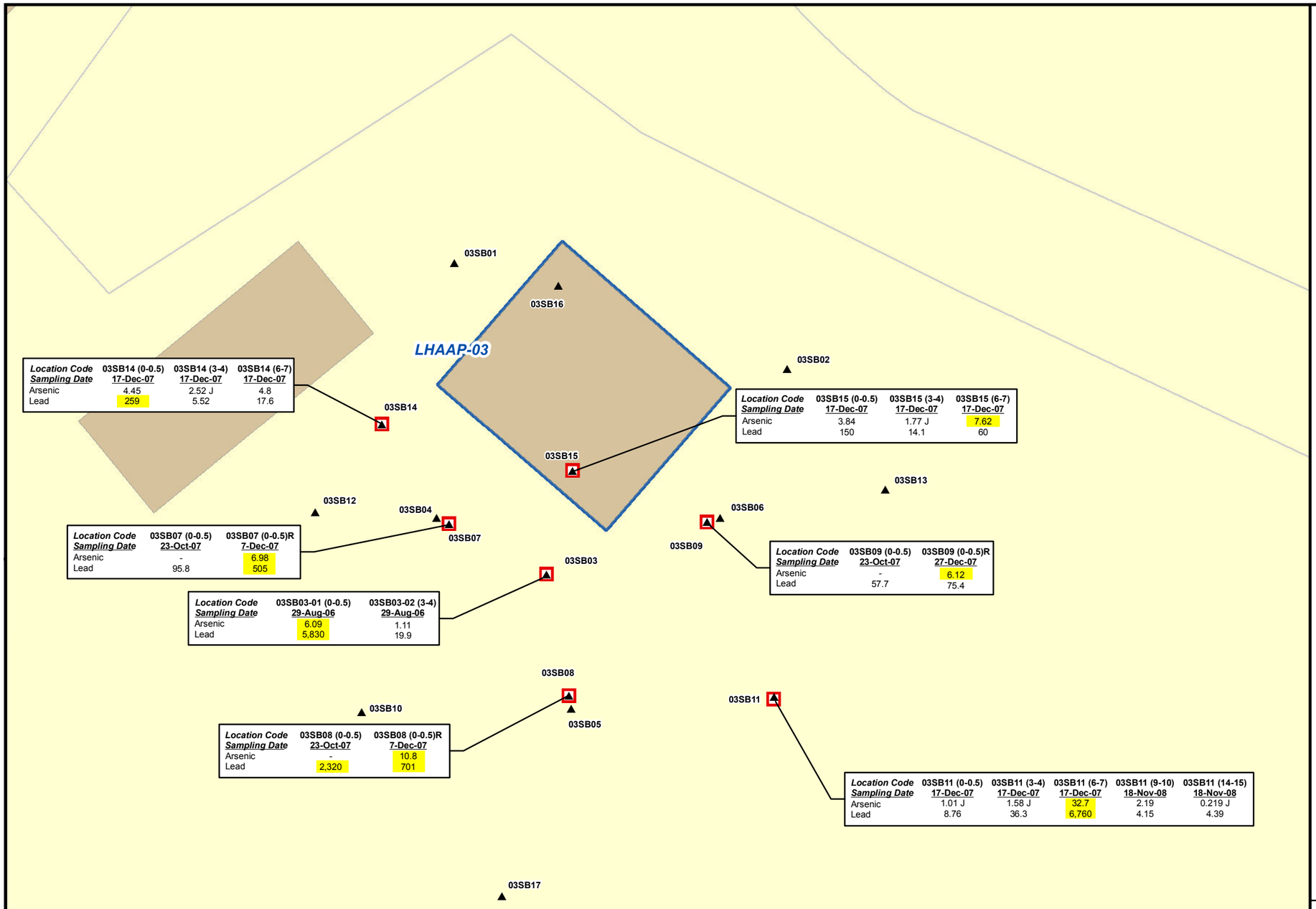
Source: Shaw, 2011, Draft Engineering Evaluation and Cost Analysis, LHAAP-03 (Former Waste Collection Pad Near Building 722-P, Paint Shop) Longhorn Army Ammunition Plant, Karnack, Texas

APTIM

Figure 2-3
Soil Boring and Monitoring Well Locations
LHAAP-03
Record of Decision
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

December
2017



N

Legend

- Soil Boring
- Locations with Concentrations Exceeding Applicable RRS3 MSCs (see Note 1).
- Roads
- Former Building Location
- Site

Notes:
1. RRS3 MSCs for arsenic and lead are 5.9 milligrams per kilogram mg/kg) and 180 mg/kg, respectively.
2. All concentrations listed are in milligram per kilogram (mg/kg)
3. J - Estimated Concentration.
4. Yellow shaded results exceed screening values.
5. RRS3 - Risk Reduction Standard 3
6. MSCs - Medium Specific Concentrations

Source:
Shaw, 2011, Draft Engineering Evaluation and Cost Analysis, LHAAP-03 (Former Waste Collection Pad Near Building 722-P, Paint Shop) Longhorn Army Ammunition Plant, Karnack, Texas.

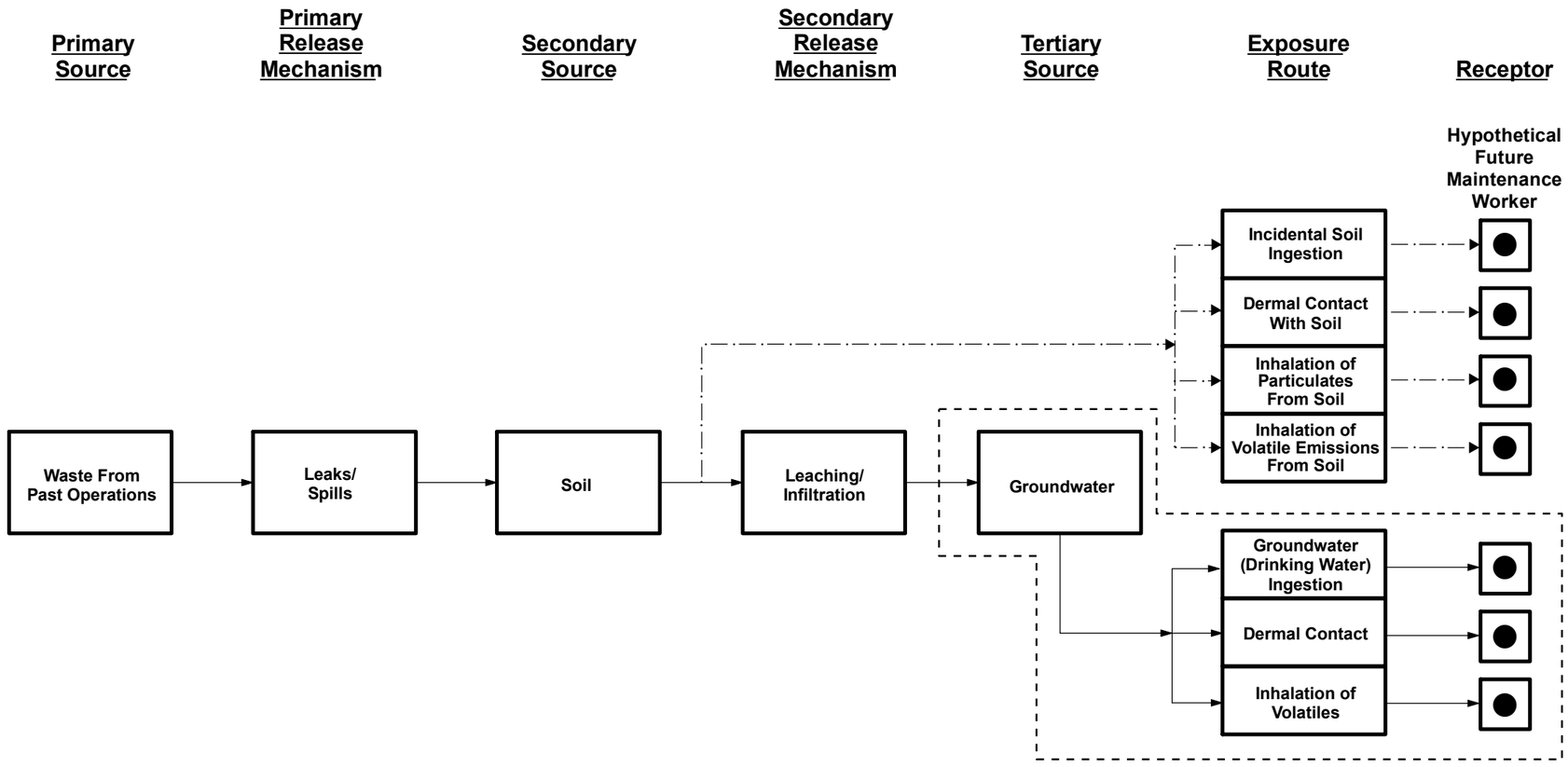
0 4 8 16
Feet

APTIM

Figure 2-4
Concentrations Exceeding Applicable RRS3 MSCs
LHAAP-03
Record of Decision
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

December 2017



Legend

- Scenario Evaluated in the Baseline Human Health Risk Assessment
- Groundwater pathways were evaluated for a larger site LHAAP-35A(58) withiin which LHAAP-03 is located. Evaluation and remediation of groundwater at LHAAP-03 will be conducted as part of remedial action at LHAAP-35A(58). No separate remedial action for groundwater is planned for LHAAP-03.
- Potential exposure pathway evaluated in the baseline human health risk assessment. No unacceptable risk was identified and no remediation will be conducted to address these exposure pathways.

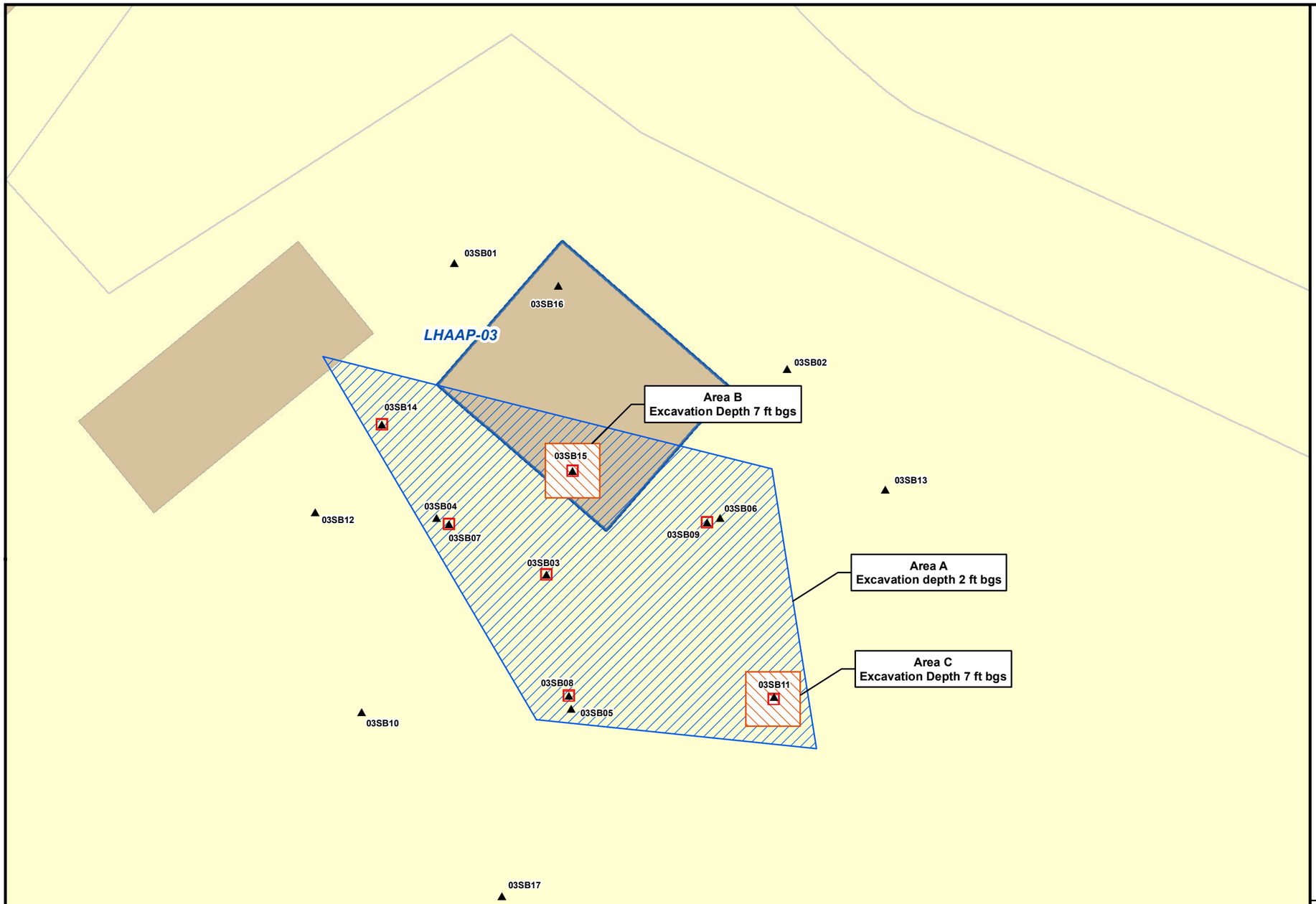
Source:
Jacobs, 2003. Final Baseline Human Health and Screening Ecological Risk Assessment for the Grooup 4 Sites. (Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60, 67, Goose Prairie Creek, Saunders Branch, Central Creek and Caddo Lake). Longhorn Army Ammunition Plant, Karnack, Texas, June.

APTIM

Figure 2-5
Conceptual Site Model
LHAAP-03
Record of Decision
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

December 2017



N

Legend

- Soil Boring
- Locations with Concentrations Exceeding Applicable RRS3 MSCs
- Target Remediation Area B and Area C (See Note 1)
- Target Remediation Area A (See Note 1)
- Roads
- Former Building Location
- Site

Notes:
1. The excavation extents will be revised as part of remedial action implementation (See section 2-12 of the ROD for details).

ft bgs - feet below ground surface

Source:
Shaw, 2011, Draft Engineering Evaluation and Cost Analysis, LHAAP-03 (Former Waste Collection Pad Near Building 722-P, Paint Shop) Longhorn Army Ammunition Plant, Karnack, Texas.

0 4 8 16
Feet

APTIM

Figure 2-6
Conceptual Target Remediation Area
LHAAP-03
Record of Decision
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

December 2017

Table 2-1: Summary of Risk Estimates

Chemical	HI	EPC (mg/kg)	New Max	Location	Note	HI
Aluminum	0.015	9230	12500	03SB01	LARGER	0.020
Antimony	0.030	8.5	8.55	03SB03	LARGER	0.030
Cadmium	0.023	18.5	1.44	03SB09	< EPC	0.023
Mercury	0.270	43.7	0.483	03SB03	< EPC	0.270
Silver	0.057	109	2.19	03SB03	< EPC	0.057
Vanadium	0.025	51.2	39.1	03SB09	< EPC	0.025
bis(2-Ethylhexyl)phthalate	0.043	200	all ND		< EPC	0.043
BHHRA Total HI	0.47				New Total HI	0.47
					% change	1.20%

Chemical	ELCR	EPC (mg/kg)	New Max	Location	Note	New ELCR
2,3,7,8-TCDD	1.80E-06	2.53E-05	none		< EPC	1.80E-06
Cadmium	1.80E-09	18.5	1.44	03SB09	< EPC	1.80E-09
Benzo(a)anthracene	7.90E-07	1.6	all ND		< EPC	7.90E-07
Benzo(a)pyrene	9.90E-06	2	all ND		< EPC	9.90E-06
Benzo(b)fluoranthene	1.50E-06	3.1	all ND		< EPC	1.50E-06
bis(2-Ethylhexyl)phthalate	4.30E-06	200	all ND		< EPC	4.30E-06
Dibenz(a,h)anthracene	1.50E-06	0.3	all ND		< EPC	1.50E-06
Indeno(1,2,3-cd)pyrene	1.00E-06	2.1	all ND		< EPC	1.00E-06
BHHRA Total ELCR	2.10E-05				New Total HI	2.10E-05
					No change	

Notes:
ELCR from Table C-53 of the BHHRA, Jacobs, 2003.
EPC from Table 3-40 of the BHHRA, Jacobs, 2003.
HI from Table C-50 of the BHHRA, Jacobs, 2003.
New Max is the maximum concentration found at LHAAP-03 soil from 0-2 feet bgs, Final Site Investigation Report, Shaw, 2009.
bgs below ground surface
BHHRA Baseline Human Health Risk Assessment
ELCR excess lifetime cancer risk
EPC exposure point concentration
HI hazard index
Max maximum
mg/kg milligrams per kilogram
ND non-detect
TCDD tetrachlorodibenzodioxin
Source: Shaw, 2012, *Comments on Draft Engineering Evaluation and Cost Analysis LHAAP-03 (published December 2011), Former Waste Collection Pad Near Building 722-P, Paint Shop, Longhorn Army Ammunition Plant, Karnack, Texas.*

Table 2-2: COCs and RGs

COC	RGs for Soil [a] (mg/kg)
Arsenic	*5.9*
Lead	180

Notes:
[a] RG/ Applicable RRS3 Industrial Soil MSC equals largest of calculated RRS3 MSC and background values. *Italicized* text indicates value equals background.
COC contaminant of concern
RG remediation goal
RRS risk reduction standard
mg/kg milligrams per kilogram
MSC medium-specific concentration

Table 2-3: Summary of Individual and Comparative Analysis of Alternatives

Criterion	Alternative 1 – No Action	Alternative 2: Excavation and Off-Site Disposal (Industrial Reuse)
Overall Protection of Human-Health and the Environment	Not Satisfied	Satisfied
	No reduction in risk to human-health and the environment.	Provides protection to human-health and the environment by removing the COC-impacted soil from the site exceeding the RGs for industrial reuse scenario.
Compliance with ARARs	Not Applicable	Satisfied
	Since no-action entails no remedial action, ARARs would not be triggered.	Complies with all the identified ARARs.
Long-Term Effectiveness	Not Applicable	Good
	Threshold criteria are not met.	Significantly reduces risk at the site and is considered permanent solution since impacted soil is removed from the site.
Reduction in Toxicity, Mobility, and Volume through Treatment	Not Applicable	Fair
	Threshold criteria are not met.	This alternative provides reduction of mobility because metals-contaminated soil is removed from the site and placed in a permitted disposal facility. Toxicity and volume are not reduced as the form and quantity of the contaminated soil is not altered.
Short-Term Effectiveness	Not Applicable	Fair
	No short-term effectiveness associated with this alternative since no remedial actions are performed.	This alternative involves relatively minor quantities of soil to be removed; there would be minimal risk to the community, workers, and the environment during the removal action. The time required to perform the alternative is approximately nine months. Soil excavation, backfilling and field activities performed as part of Alternative 2 would present short-term risks/hazards to site workers. However, adherence to standard health and safety procedures would minimize exposure of the workers.
Implementability	Not Applicable	Fair
	No implementability issues associated with this alternative since no actions are performed.	The removal and disposal of COC-impacted soil for Alternative 2 is easily implementable.
Cost ($)*	Not Applicable	Fair
	No cost	$87,878[a]
Regulatory Acceptance	The State of Texas and the USEPA cannot accept this alternative	The State of Texas and the USEPA support the selected alternative.

Criterion	Alternative 1 – No Action	Alternative 2: Excavation and Off-Site Disposal (Industrial Reuse)
Community Acceptance	The Proposed Plan for LHAAP-03 was issued to the public and discussed at a public meeting (see Section 2.3 for details). The responsiveness summary portion of this ROD addresses the public's comments and concerns about the selected remedy.	The Proposed Plan for LHAAP-03 was issued to the public and discussed at a public meeting (see Section 2.3 for details). The responsiveness summary portion of this ROD addresses the public's comments and concerns about the selected remedy.

Notes:
[a] PW assuming total duration of 30 years and a discount rate of 2 percent.
Alternative that costs the least was rated as good.
ARAR Applicable or Relevant and Appropriate Requirement
COC contaminant of concern
IR Installation Restoration
RAOs Remedial Action Objectives
RG remediation goal
ROD Record of Decision

Table 2-4: Cost Estimate for the Selected Remedy

Cost Item	Cost
Remedial Design/Remedial Action Work Plan	$18,055
Pre-Excavation Sampling	$8,778
Excavation and Off-Site Disposal	$28,535
Confirmation and Waste Characterization Sampling	$2,543
Construction Completion Report	$15,022
Total Direct Cost	**$72,932**
Contingency (10% of construction cost)	$3,985
Project Management (10% of construction cost)	$4,384
Construction Management (10% of construction cost)	$6,576
Total Present Value	**$87,878**

Table 2-5: Chemical-Specific ARARs

Citation	Prerequisite	Requirement	ARAR Determination [a]	Comments
Surface/Subsurface Soils				
TCEQ Texas Risk Reduction Rules 30 TAC 335.563 (i)(2)(A) and (j)(1)	Closure or remediation of industrial solid waste or municipal hazardous waste per the requirements of 30 TAC 335.8	For closure in accordance with RRS3, cleanup goals for soil shall not exceed values which will allow the air, surface water, and groundwater cleanup levels specified in subsections (f) - (h) of Section 335.563, respectively, to be maintained over time taking into account the effects of engineering controls.	Applicable	The cleanup goals for soil at LHAAP-03 are presented in Section 2.8 and are applicable RRS3 industrial soil MSCs based on groundwater protection. The details on the calculations for RRS3 industrial soil MSCs are presented in the RI/FFS Report (AECOM, 2013).

Notes:
[a] Only substantive requirements of specific citations are considered ARARs.

ARAR	Applicable or Relevant and Appropriate Requirement
CFR	Code of Federal Regulation
LHAAP	Longhorn Army Ammunition Plant
MSC	medium-specific concentration
RCRA	Resource Conservation and Recovery Act
RI/FFS	Remedial Investigation/Focused Feasibility Study
RRS	risk reduction standard
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TCLP	toxicity characteristic leaching procedure

Table 2-6: Action-Specific ARARs

Citation	Prerequisite	Requirement	ARAR Determination	Comments
General Site Preparation, Excavation, Grading, and Backfilling Activities				
Opacity Standard 30 TAC 111.111(a)(8)(A)	Fugitive emissions from land-disturbing activities (e.g., excavation, construction)	Visible emissions shall not be permitted to exceed opacity of 30% for any six minute period from any source.	Applicable	Fugitive dust emissions of particulate matter are expected from the excavation, grading, and earth-moving activities. Measures such as applying water to minimize fugitive dust emissions would be required.
Waste Generation, Management, and Storage				
Characterization of Solid Waste 40 CFR 262.11 30 TAC 335.62 30 TAC 335.504 30 TAC 335.503(a)(4)	Generation of solid waste, as defined in 30 TAC 335.1	A person who generates a solid waste must determine if that waste is hazardous. After making the hazardous waste determination as required, if the waste is determined to be nonhazardous, the generator shall then classify the waste as Class 1, Class 2, or Class 3 (as defined in Section 335.505 through Section 335.507) using one or more of the methods listed in Section 335.503(a)(4) and Section 335.508.	Applicable	Applicable for any operation where waste is generated. The determination of whether the wastes generated during the implementation of the selected remedy including excavated metal-impacted soil are hazardous, Class 1, Class 2, or Class 3 will be made at the time the wastes are generated.
Characterization of Hazardous Waste 40 CFR 264.13(a)(1) and (2) 30 TAC 335.509 30 TAC 335.511	Generation of a RCRA hazardous waste for treatment, storage, or disposal	Must obtain a detailed chemical and physical analysis of a representative sample of the waste(s) that at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with 40 CFR 264 and 268.	Applicable	Applicable when analyzing waste generated during the impacted soil excavation activities.
Requirements for Temporary Storage of Hazardous Waste in Accumulation Areas 40 CFR 262.34(a) and (c)(1) 30 TAC 335.69(a) and (d)	On-site accumulation RCRA hazardous waste	A generator may accumulate hazardous waste at the facility provided that • Waste is placed in containers that comply with 40 CFR 264.171 to 264.173 (Subpart I); and • Container is marked with the words “hazardous waste”; or • Container may be marked with other words that identify the contents.	Applicable	Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during response action activities, such as metal-impacted soil excavation are hazardous will be made at the time the wastes are generated.
Requirements for the Use and Management of Containers 40 CFR 264.171–264.173 30 TAC 335.69(e) 30 TAC 335.152(a)(7)	Storage of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere, in a container	Containers of RCRA hazardous waste must be: • maintained in good condition, • compatible with hazardous waste to be stored, and • closed during storage except to add or remove waste.	Applicable	Substantive requirements are applicable for accumulation of waste for less than 90 days if the waste is RCRA hazardous waste and is stored on-site in containers.
Staging Piles 40 CFR § 264.554(d)(1)(i–ii) and (d)(2), (e), (f), (h), (i), (j), and (k) 30 TAC 335.152(a)(14)	Hazardous remediation waste temporarily stored in piles.	Allows generators to accumulate solid remediation waste in a USEPA-designated pile for storage only, up to 2 years, during remedial operations without triggering LDRs	Applicable	Substantive requirements are applicable for storage of excavated soil. The staging pile will be designed to prevent or minimize the releases of COCs into the environment, and minimize or adequately control cross-media transfer of pollutants.
Closure				
Requirements for Closure of a RCRA Container Storage Area 40 CFR 264.178 30 TAC 335.152(a)(7)	Closure of a RCRA-permitted container storage area	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners.	Applicable	Substantive requirements are applicable if RCRA hazardous wastes are generated and stored in containers.

Notes:
[a] Only substantive requirements of specific citations are considered ARARs.

ARAR Applicable or Relevant and Appropriate Requirement
CFR Code of Federal Regulations
COC contaminant of concern
RCRA Resource Conservation and Recovery Act
TAC Texas Administrative Code
LDR land disposal restrictions
USEPA U.S. Environmental Protection Agency

3 RESPONSIVENESS SUMMARY

The Responsiveness Summary serves three purposes. First, it provides the U.S. Army, the USEPA, and the TCEQ with information about community concerns with the Preferred Alternative at LHAAP-03 as presented in the Proposed Plan. Second, it shows how the public's comments were considered in the decision-making process for selection of the remedy. Third, it provides a formal mechanism for the U.S. Army to respond to public comments.

The U.S. Army, the USEPA, and the TCEQ provide information regarding LHAAP-03 through public meetings, the Administrative Record for the facility, and announcements published in the *Marshall News Messenger* newspaper. **Section 2.3** discusses community participation on LHAAP-03, including the dates for the public comment period, the date, location, and time of the public meetings, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record:

- Transcript of the public meeting held on May 30, 2013
- Presentation slides from the May 30, 2013 public meeting
- Written questions and comments from the public during the public comment period, and the U.S. Army response to those comments

3.1 Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including the public and community groups that were received in written or verbal form.

Lead Cleanup Level

Comment: Mr. George Rice submitted a comment on behalf of the Caddo Lake Institute related to the proposed soil lead cleanup level at LHAAP-03. During the public meeting held on May 30, 2013, RAB member Ms. Judy VanDeventer specifically asked "What will be the Army's response to Mr. George Rice's comment," which is summarized below.

The Army determined the cleanup level for lead of 180 milligrams per kilogram (mg/kg) using Soil Attenuation Model (SAM). The commenter stated that the input values used in the SAM were in general, appropriate; however the lead distribution coefficient (K_d) value used in the SAM was too large. The K_d value used by the Army (1,830 mg/kg) corresponds to clayey soils and was taken from a table published by TCEQ (30 TAC §350.73[f][1][A]). The commenter stated that this K_d value is not representative of all soils at LHAAP-03 and if the TCEQ published value of K_d for loamy soils (597 mg/kg) is used in the SAM, the calculated lead cleanup level is 58 mg/kg. Thus, the Army should remove all soils that contain a lead concentration greater than 58 mg/kg. In addition to the soil it plans to excavate, the Army should also excavate soil in the vicinity of boring SB04 to a depth of at least four feet.

Response: The K_d value is used in the SAM to calculate the concentration of lead in soil leachate in the *impacted soil zone*. Therefore, the value of K_d used in the SAM needs to be representative of the impacted soil zone only. Based on the investigations conducted to date, the potentially impacted soil zone (on the basis of comparison with RRS2 and RRS3 MSCs) at LHAAP-03 extends from surface to approximately seven feet bgs depending on the location at the site (see Table 4-1 and Figure 4-1 of the RI/FFS [AECOM 2013a]). A review of the field logs for borings

at or in the immediate vicinity of LHAAP-03 (03WW01, 03SB01, 03SB02, 03SB03, 35AWW01/ 35AWW08/ LHSMW05) included in the site reports indicate that clays constitute the majority of the impacted soil zone (up to approximately 10 feet bgs) (Shaw, 2009; and AECOM, 2013a). Therefore, the use of K_d value representative of clayey soils (1,830 mg/kg) in the SAM model to calculate the soil cleanup goal for lead is reasonable.

Extent of Contaminated Soil

Comment: Mr. George Rice submitted a comment on behalf of the Caddo Lake Institute related to the extent of contaminated soil at LHAAP-03. During the public meeting held on May 30, 2013, RAB member Ms. Judy VanDeventer specifically asked "What will be the Army's response to Mr. George Rice's comment," which is summarized below.

The comment stated that there are no soil borings to the northwest or southeast of the zone known to contain contaminated soils. Therefore, the full extent of contamination is unknown. The Army should advance and sample at least two more soil borings; one to northwest, and one to the southeast of the contaminated zone.

Response: The Army is planning to collect additional soil samples at LHAAP-03 to refine the extent of contamination and therefore concurs with the recommendation. As stated in the RI/FFS (AECOM 2013a) and the Proposed Plan (AECOM 2013b), soil sampling will be conducted prior to the start of excavation to further define the current boundaries of the excavation area. Once the excavation is complete, confirmation samples will be collected confirming full extent of contamination was defined and removed. A detailed sampling plan for pre-excavation sampling will be presented in the Remedial Design/ Remedial Action Work Plan that will be made part of the Administrative Record for the site and will be available for public review.

Groundwater Cleanup

Comment: Mr. George Rice on behalf of the Caddo Lake Institute commented that the Army's plan to deal with groundwater contamination as part of the remedial action for LHAAP-35(58) is reasonable.

Response: The Army acknowledges the concurrence of Caddo Lake Institute with respect to this issue.

Concurrence with George Rice Submitted Comments

Comment: Mr. Bob Cargill (May 29, 2013 email) and Mr. Paul Fortune (June 6, 2013 email) submitted the same comment concurring with George Rice's comments addressed above and requesting Army follow Mr. Rice's recommendations.

Response: See responses above.

3.2 Technical and Legal Issues

This section is used to expand on technical and legal issues. However, there are no issues of that nature beyond the technical issues already discussed in **Section 3.1**.

4 REFERENCES

AECOM Technical Services, Inc. (AECOM), 2012. *Revised Technical Memorandum, Steps to Remedy-in-Place for LHAAP-03/LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas,* November.

AECOM, 2013a. *Final Remedial Investigation – Focused Feasibility Study, Longhorn Army Ammunition Plant*, March.

AECOM, 2013b. *Final Proposed Plan, Longhorn Army Ammunition Plan*, May.

Day & Zimmerman, 1991. *Final Report, Hazardous Waste Minimization Plan, Longhorn AAP, Phase III Report*, June.

Rice, G. 2013. Comments on the Draft Final Proposed Plan for LHAAP-03, Former Waste Collection Pad, Building 722-P Paint Shop, Longhorn Ammunition Plant, Karnack, Texas, April 2013. May 28.

Jacobs Engineering Corporation (Jacobs), 2002. *Final Remedial Investigation Report for the Group 4 Sites*, January.

Jacobs, 2003. *Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 4 Sites (Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60, 67, Goose Prairie Creek, Saunder's Branch, Central Creek and Caddo Lake), Longhorn Army Ammunition Plant, Karnack, Texas, Oak Ridge, Tennessee*, June.

Plexus Scientific Corporation (Plexus), 2005 *Environmental Site Assessment, Phase I and II Report, Final, Production Areas, Longhorn Army Ammunition Plan, Karnack, Texas*, February.

Shaw Environmental, Inc. (Shaw), 2007a. *Final Data Gaps Investigation Report, Longhorn Army Ammunition Plant, Karnack, Texas,* April.

Shaw, 2007b. *Final Installation-Wide Baseline Ecological Risk Assessment, Longhorn Army Ammunition Plant, Karnack, Texas,* November.

Shaw, 2009. *Final Site Investigation Report, LHAAP-03 (Waste Collection Pad Near Building 722-P, Paint Shop),* August.

Shaw, 2011. *Draft Engineering Evaluation and Cost Analysis, LHAAP-03 (Former Waste Collection Pad Near Building 722-P, Paint Shop), Longhorn Army Ammunition Plant, Karnack, Texas,* September.

Texas Water Commission (TWC), 1988. *RCRA Facility Assessment, Longhorn Army Ammunition Plant*, April.

U.S. Army Corps of Engineers (USACE), 2010. *Final Record of Decision LHAAP-35A(58), Shops Area, Group 4 Longhorn Army Ammunition Plant Karnack, Texas.* September.

USACE, 2018. *Draft Final Explanation of Significant Differences, LHAAP-35A(58), Shops Area, Group 4, Record of Decision, dated September 2010, Longhorn Army Ammunition Plant Karnack, Texas.* Pending TCEQ review June.

U.S. Army Environmental Hygiene Agency (USAEHA), 1987. *Hazardous Waste Study No. 37-26-1665-87, Hazardous Waste Minimization*, May.

U.S. Department of the Army (U.S. Army), 2004. *Memorandum of Agreement Between the Department of the Army and the Department of the Interior for the Interagency Transfer of Lands at the Longhorn Army Ammunition Plant for the Caddo Lake National Wildlife Refuge, Harrison County, Texas*, Signed by the Department of the Interior on April 27, 2004 and the Army on April 29, 2004.

U.S. Environmental Protection Agency (USEPA), 1991. *A guide to principal threat and low level threat wastes*, Superfund Publication 9380.3-06FS (Fact Sheet, November version), Office of Emergency Remedial Response. Washington, D.C., November.

APPENDIX A: Public Notice

PUBLIC NOTICE

The United States Army invites public comment on the Proposed Plan for environmental site

LHAAP-03 (FORMER PAINT SHOP WASTE COLLECTION PAD)

Longhorn Army Ammunition Plant, Texas

The U.S. Army is the lead agency for environmental response actions at the former Longhorn Army Ammunition Plant (LHAAP). In partnership with the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency Region 6, the U.S. Army has developed a Proposed Plan for site LHAAP-03. Although the Proposed Plan identifies the preferred remedy for the site, the U.S. Army welcomes the public's review and comments. **The public comment period begins May 13, 2013 and ends June 12, 2013. On Tuesday, May 30, 2013, from 6:00 to 8:00 p.m., the U.S. Army is inviting all interested parties to attend an open house forum to review the Proposed Plan and ask questions. The open house forum will be held at the Karnack Community Center, Highway 134 and Spur 449, Karnack, Texas.** Copies of the Proposed Plan and supporting documentation are available for public review at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670. A summary of LHAAP-03, including a short discussion of the planned Remedial Action, is provided below.

The Former Paint Shop Waste Collection Pad was used as a paint waste collection site, and is approximately 50 feet to the west of former Building 722-P paint shop. Building 722-P was used for paint spray and polyurethane spray coating of materials. The soil contaminant(s) of concern (COCs) are lead and arsenic. LHAAP-03 lies within the boundary of a larger environmental site, LHAAP-35A(58), and LHAAP-03 groundwater is being addressed by activities completed for LHAAP-35A(58). The Preferred Alternative to address contaminated soil at LHAAP-03 is excavation and off-site disposal. This will result in the removal of an estimated 50-150 cubic yards of soil with disposal off-site in a permitted landfill.

For further information or to submit comments contact:

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US Army Corps of Engineers ®
Tulsa District