From: Foss, William A.
Sent: Friday, May 21, 2021 1:50 PM
To: Mena, Kim
Subject: FW: February 2021 Draft RACR for LHAAP-03

Here is EPA's no comment email for the Draft LHAAP-03 RACR.

WILLIAM A. FOSS, PG
Senior Geologist

OUR OFFICE ADDRESS IS CHANGING APRIL 30, 2021
PLEASE USE THE NEW ADDRESS BELOW

APTIM | Government

O 713 243 7095
M 281 380 3241
E William.Foss@aptim.com

10333 Richmond Ave, Suite 1030
Houston, TX 77042

APTIM.com

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Monday, March 15, 2021 2:50 PM
To: Foss, William A. <William.Foss@aptim.com>; April Palmie <april.palmie@tceq.texas.gov>
Cc: Williams, Aaron K SWF @SWT <Aaron.K.Williams@usace.army.mil>; Zeiler, Rose M CIV USARMY HQDA DCS G-9 (USA) <rose.m.zeiler.civ@mail.mil>; Maly, Andrew R CIV USARMY IMCOM AEC (USA) <andrew.r.maly.civ@mail.mil>; Toudouze, Thomas P III CIV USARMY IMCOM AEC (USA) <thomas.p.toudouze2.civ@mail.mil>; Zographos, Laura K CIV USARMY IMCOM AEC (USA) <laura.k.zographos.civ@mail.mil>; Kent Becher <kdbecher@usgs.gov>; Smith, Richard P CIV USARMY CESWF (US) <Richard.P.Smith@usace.army.mil>; paul_bruckwicki@fws.gov; Kim Nemmers <knemmers@bhate.com>; Srivastav, Praveen <Praveen.Srivastav@aptim.com>; Burton, Terry <Burton.Terry@epa.gov>
Subject: RE: February 2021 Draft RACR for LHAAP-03

EXTERNAL SENDER

Hi Bill,

Thank you for coordinating and providing an opportunity to review. EPA has no comments on the *Draft Remedial Action Completion Report, LHAAP-03 Former Waste Collection Pad, Building 722-P Paint Shop* at this time. Please let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Foss, William A. <William.Foss@aptim.com>
Sent: Wednesday, February 10, 2021 6:43 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; April Palmie <april.palmie@tceq.texas.gov>
Cc: Williams, Aaron K SWF @SWT <Aaron.K.Williams@usace.army.mil>; Zeiler, Rose M CIV USARMY HQDA DCS G-9 (USA) <rose.m.zeiler.civ@mail.mil>; Maly, Andrew R CIV USARMY IMCOM AEC (USA) <andrew.r.maly.civ@mail.mil>; Toudouze, Thomas P III CIV USARMY IMCOM AEC (USA) <thomas.p.toudouze2.civ@mail.mil>; Zographos, Laura K CIV USARMY IMCOM AEC (USA) <laura.k.zographos.civ@mail.mil>; Kent Becher <kdbecher@usgs.gov>; Smith, Richard P CIV USARMY CESWF (US) <Richard.P.Smith@usace.army.mil>; paul_bruckwicki@fws.gov; Kim Nemmers <knemmers@bhate.com>; Srivastav, Praveen <Praveen.Srivastav@aptim.com>
Subject: February 2021 Draft RACR for LHAAP-03

Lauren and April,

The *Draft Remedial Action Completion Report, LHAAP-03 Former Waste Collection Pad, Building 722-P Paint Shop*, has been uploaded to a sub-folder in the "Documents" folder of the project portal for your review and can be accessed directly via the links provided below. As agreed to in the October 2020 Monthly Managers' Meeting, the laboratory data packages for Appendix B are included in Level II format. Please let us know if you need the Level IV packages to complete your review. The Level IV packages will be included with the Final Administrative Record version of the document. Comments for this draft report are requested by March 12, 2021.

The report has been separated into two files due to the file sizes. The first file contains the report text, tables, figures, and all appendices except Appendix B (Laboratory Data Packages) and is approximately 12 MB in size. The second file contains only Appendix B and is approximately 100 MB in size. Electronic copies of the transmittal letters are included in the report PDF and are attached to this email for your convenience.

February 2021 Draft Remedial Action Completion Report, LHAAP-03 (Without Appendix B)
Feb 2021 Draft Remedial Action Completion Report for LHAAP-03 (Without Appendix B)

February 2021 Draft Remedial Action Completion Report, LHAAP-03 (Level II Appendix B Only)
Feb 2021 Draft Remedial Action Completion Report for LHAAP-03 (Level II Appendix B Only)

Please let us know if you have any questions or have any difficulty accessing the files. Thanks!

Bill

WILLIAM A. FOSS, PG
Scientist IV

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2500 CityWest Blvd., Suite 1700
Houston, TX 77042

APTIM.com

From: Foss, William A.
Sent: Friday, May 21, 2021 1:49 PM
To: Mena, Kim
Subject: FW: Draft Final Remedial Action Completion Report, LHAAP-03

Kim,

See below for the TCEQ approval of the DF LHAAP-03 RACR. EPA had no comments on the draft. I will forward that email separately.

WILLIAM A. FOSS, PG
Senior Geologist

OUR OFFICE ADDRESS IS CHANGING APRIL 30, 2021
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M 281 380 3241
E William.Foss@aptim.com

10333 Richmond Ave, Suite 1030
Houston, TX 77042

APTIM.com

From: April Palmie <april.palmie@tceq.texas.gov>
Sent: Friday, April 2, 2021 10:21 AM
To: Foss, William A. <William.Foss@aptim.com>; Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Williams, Aaron K SWF @SWT <Aaron.K.Williams@usace.army.mil>; Zeiler, Rose M CIV USARMY HQDA DCS G-9 (USA) <rose.m.zeiler.civ@mail.mil>; Maly, Andrew R CIV USARMY IMCOM AEC (USA) <andrew.r.maly.civ@mail.mil>; Burton, Terry <Burton.Terry@epa.gov>; Kent Becher <kdbecher@usgs.gov>; Toudouze, Thomas P III CIV USARMY IMCOM AEC (USA) <thomas.p.toudouze2.civ@mail.mil>; Zographos, Laura K CIV USARMY IMCOM AEC (USA) <laura.k.zographos.civ@mail.mil>; paul_bruckwicki@fws.gov; Kim Nemmers <knemmers@bhate.com>; Srivastav, Praveen <Praveen.Srivastav@aptim.com>; Smith, Richard P SWT <Richard.P.Smith@usace.army.mil>; April Palmie <april.palmie@tceq.texas.gov>
Subject: RE: Draft Final Remedial Action Completion Report, LHAAP-03

EXTERNAL SENDER

Good morning. I've review the edits to the Draft Final Remedial Action Completion Report, LHAAP-03. All of my requested edits have been addressed.

Thank you,

April

From: Foss, William A. <William.Foss@aptim.com>
Sent: Thursday, April 1, 2021 12:23 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; April Palmie <april.palmie@tceq.texas.gov>
Cc: Williams, Aaron K SWF @SWT <Aaron.K.Williams@usace.army.mil>; Zeiler, Rose M CIV USARMY HQDA DCS G-9 (USA) <rose.m.zeiler.civ@mail.mil>; Maly, Andrew R CIV USARMY IMCOM AEC (USA) <andrew.r.maly.civ@mail.mil>; Burton, Terry <Burton.Terry@epa.gov>; Kent Becher <kdbecher@usgs.gov>; Toudouze, Thomas P III CIV USARMY IMCOM AEC (USA) <thomas.p.toudouze2.civ@mail.mil>; Zographos, Laura K CIV USARMY IMCOM AEC (USA) <laura.k.zographos.civ@mail.mil>; paul_bruckwicki@fws.gov; Kim Nemmers <knemmers@bhate.com>; Srivastav, Praveen <Praveen.Srivastav@aptim.com>; Smith, Richard P SWT <Richard.P.Smith@usace.army.mil>
Subject: Draft Final Remedial Action Completion Report, LHAAP-03

Lauren and April,

The *Draft Final Remedial Action Completion Report* for LHAAP-03, has been uploaded to a report-specific folder in the "Documents" folder of the project portal for your review and can be accessed directly via the links provided below. The document includes revisions to address the comments on the Draft report received from the TCEQ on March 1, 2021. A table showing the responses to the TCEQ comments is included with this Draft Final. In accordance with the Federal Facility Agreement, this Draft Final will be considered Final after 30 days without further comment. Electronic copies of the transmittal letters are included in the report PDF and are attached to this email for your convenience.

The document has been uploaded as 2 separate files due to the size of the analytical package and waste manifest appendices. The first file contains the report text, figures, tables, and all appendices except for Appendix B (Analytical Data Reports) and is approximately 12 MB in size. The second file contains just Appendix B and is approximately 100 MB. As agreed to in the October 2020 Monthly Managers' Meeting, the laboratory data packages for Appendix B are included in Level II format. Please let us know if you need the Level IV packages to complete your review. The Level IV packages will be included with the Final Administrative Record version of the document.

April 2021 Draft Final Remedial Action Completion Report, LHAAP-03 - no Appendix B (~12 MB)
April 2021 Draft Final Remedial Action Completion Report, LHAAP-03

Appendix B - April 2021 Draft Final Remedial Action Completion Report, LHAAP-03 (~100 MB)
Appendix B - Apr 2021 Draft Final Remedial Action Completion Report, LHAAP-03

Please let us know if you have any questions or have any difficulty accessing the files. Thanks!

Bill

WILLIAM A. FOSS, PG
Scientist IV

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

April 1, 2021

DAIN-ODB-LO

Ms. Lauren Poulos
U.S. Environmental Protection Agency
Federal Facilities Section R6
1201 Elm Street, Suite 500
Dallas, TX 75270-2002

Re: Draft Final Remedial Action Completion Report, LHAAP-03 Former Waste Collection Pad, Building 722-P Paint Shop, Longhorn Army Ammunition Plant, Karnack, Texas, April 2021

Dear Ms. Poulos,

An electronic copy of the above referenced document has been added to the project portal's "Documents" folder at the following address for your review: (https://docs.cbifederalservices.com/sites/501032/regulators/Shared%20Documents/Forms/AllItems.aspx). An electronic copy of this letter and download instructions for the electronic file have been sent via email. The document includes revisions to address the comments on the Draft report received from the TCEQ on March 1, 2021. A table showing the responses to the TCEQ comments is included with this Draft Final. In accordance with the Federal Facility Agreement, this Draft Final will be considered Final after 30 days without further comment.

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, on behalf of the Army as part of Bhate's Performance Based Remediation contract for the facility. I ask that Kim Nemmers, Bhate's Project Manager, be copied on any communications related to the project.

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

Electronic Copies furnished:
A. Palmie, TCEQ, Austin, TX
P. Bruckwicki, USFWS, Caddo Lake NWR, TX (1 hard copy and 1 CD)

R. Smith USACE, Tulsa District, OK
A. Williams, USACE, Tulsa District, OK
A. Maly USAEC, San Antonio, TX
K. Nemmers, Bhate, Lakewood, CO
P. Srivastav, APTIM, Houston, TX

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

April 1, 2021

DAIN-ODB-LO

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

Re: Draft Final Remedial Action Completion Report, LHAAP-03 Former Waste Collection Pad, Building 722-P Paint Shop, Longhorn Army Ammunition Plant, Karnack, Texas, April 2021

Dear Ms. Palmie,

An electronic copy of the above referenced document has been added to the project portal's "Documents" folder at the following address for your review: (https://docs.cbifederalservices.com/sites/501032/regulators/Shared%20Documents/Forms/AllItems.aspx). An electronic copy of this letter and download instructions for the electronic file have been sent via email. The document includes revisions to address the comments on the Draft report received from the TCEQ on March 1, 2021. A table showing the responses to the TCEQ comments is included with this Draft Final. In accordance with the Federal Facility Agreement, this Draft Final will be considered Final after 30 days without further comment.

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, on behalf of the Army as part of Bhate's Performance Based Remediation contract for the facility. I ask that Kim Nemmers, Bhate's Project Manager, be copied on any communications related to the project.

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

Electronic Copies furnished:
L. Poulos, USEPA Region 6, Dallas, TX
P. Bruckwicki, USFWS, Caddo Lake NWR, TX (1 Hard Copy and 1 CD)
R. Smith, USACE, Tulsa District, OK

A. Williams, USACE, Tulsa District, OK
A. Maly, USAEC, San Antonio, TX
K. Nemmers, Bhate, Lakewood, CO
P. Srivastav, APTIM, Houston, TX

Response to Comments on
Draft Remedial Action Completion Report for LHAAP-03
Longhorn Army Ammunition Plant, Karnack, Texas

Document Date: 10 February 2021
Comment Date: 1 March 2021

Reviewer: April Palmie, TCEQ
Respondent: Dr. Rose Zeiler

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X)
2. Commenter Agrees (A) with response, or Does Not Agree (D) with response

Comment Ref. #	Section, Page Ref.	TCEQ Comment	C, D, E, or X	Response	A or D[2]
1.	Section 1.4; Page 1-4	First sentence – replace "in lieu if" with "in lieu of"	C	Text will be revised as requested.	
2.	Section 2.1; Page 2-1	First sentence – replace "planned" with "completed"	C	Text will be revised as requested.	
3.	Section 2.1.2; Page 2-2	First paragraph on page, revise sentence as shown (or similar): However, prior to receipt of the results, rainfall once again filled the excavations with runoff and the area was inaccessible to heavy equipment.	C	Text will be revised to "However, prior to receipt of the results, rainfall once again filled the excavations with runoff and the area became inaccessible to heavy equipment."	
4.	Section 2.2; Page 2-3	Revise sentence as shown (or similar): **Area C.** This area remained unchanged from the ROD (Bhate 2018a), but the locations of ~~was detached from~~ Area C and monitoring well 03WW01 were corrected as described in **Section**	C	Text will be revised to "This area remained unchanged from the ROD (Bhate 2018a), but the locations of Area C and monitoring well 03WW01 were corrected, as described in **Section 1.4** and **Section 2.1.1,** due to a discrepancy identified in the field between the 2007 location of 03SB11 and the 2008	

		1.4 and **Section 2.1.1** due to a discrepancy identified in the field between the 2007 location of 03SB11 and the 2008 03SB11 sample location that was converted into the well 03WW01.		03SB11 sample location that was converted into monitoring well 03WW01."	
5.	Table 3-1	Update Table 3-1 so it reflects the actual number and type of samples collected. Last column should be titled "Confirmation Samples Collected" and the data should be updated. Update Total # Samples Collected and the title (not "to be") Update "Estimated Total Volume" and "Estimated Floor Area" columns	C C C	Table 3-1 will be revised to show the number of samples collected, including samples that exceeded the cleanup levels (as mentioned in Comment #6). The table will be updated as requested. The Volume and Floor Area columns will be updated.	
6.	Table 3-2	The table should also include the confirmation results that failed and resulted in additional excavation. Shade results above criteria blue and bold.	C	The samples from Area C that contained concentrations exceeding the cleanup values will be added to Table 3-2 and concentrations exceeding the cleanup value will be bolded and highlighted in blue as requested.	

Draft Final

Remedial Action Completion Report, LHAAP-03 Former Waste Collection Pad, Building 722-P Paint Shop

Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers, Tulsa District
Contracting Division
2488 East 81st Street
Tulsa, Oklahoma 74137-4290

Prepared by

bhate

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Birmingham, Alabama 35205
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Prepared by

APTIM

Aptim Federal Services, LLC
2500 CityWest, Suite 1700
Houston, Texas 77042

Contract No. W9128F-13-D-0012
Task Order No. W9128BV17F0150
Project No. 501032
Rev 0
April 2021

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Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Draft Final • Rev 0 • April 2021

Acronyms and Abbreviations

APTIM	Aptim Federal Services, LLC
bgs	below ground surface
Bhate	Bhate Environmental, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
DoD	Department of Defense
DoE	Department of Energy
FFA	Federal Facility Agreement
GWTP	groundwater treatment plant
HDPE	high-density polyethylene
IWWP	Installation-Wide Work Plan
LHAAP	Longhorn Army Ammunition Plant
LUC	land use control
mg/kg	milligrams per kilogram
MSC	medium-specific concentration
NPL	National Priorities List
RAO	remedial action objective
RAWP	Remedial Action Work Plan
RD	remedial design
ROD	record of decision
RRS3	Risk Reduction Standard No. 3
TCEQ	Texas Commission on Environmental Quality
U.S. Army	U.S. Department of the Army
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Draft Final • Rev 0 • April 2021

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers, Tulsa District, contracted Bhate Environmental Associates, Inc. (Bhate), under the Omaha Multiple Environmental Government Acquisition, National Small Business Multiple Award Task Order Contract for Environmental Remediation Services with Military Munitions Response Program, Task Order No. W9128BV17F0150 to conduct environmental restoration of LHAAP-03 at Longhorn Army Ammunition Plant (LHAAP). The Bhate Team consists of Bhate and Aptim Federal Services, LLC (APTIM). This Remedial Action Completion Report was prepared to describe the implementation of the soil excavation remedy for LHAAP-03, as described in the Final Record of Decision (ROD) (Bhate 2018a) and the Remedial Design (RD)/Remedial Action Work Plan (RAWP) (Bhate 2019).

1.1 Site Description

LHAAP is approximately 14 miles northeast of Marshall, Texas and approximately 40 miles west of Shreveport, Louisiana (**Figure 1-1**). The installation occupies approximately 1,100 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 began in 1990. After its listing on the NPL, the U.S. Department of the Army (U.S. Army), the U.S. Environmental Protection Agency (USEPA), and the Texas Water Commission (now the Texas Commission on Environmental Quality [TCEQ]) entered into a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §120 Federal Facility Agreement (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. LHAAP has been under the administrative control of the Base Realignment and Closure Division of the Army since 2003 and is Defense Environmental Restoration Account funded. Approximately 7,279 acres of LHAAP have been transferred by 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 1-2**). Building 722-P was used for paint spraying and polyurethane spray coating of various items. LHAAP-03 was a waste collection site (originally identified as a 16-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) (**Figure 1-2**).

1.2 Remedial Action Objectives

The remedial action objective (RAO) developed for LHAAP-03 and outlined in the Final ROD (Bhate 2018a) is to protect human health and the environment by preventing lead and arsenic contaminated soils from potentially leaching into the underlying groundwater. Per the ROD's RAOs and consistent with the National Contingency Plan, chemicals of concern (COC) and cleanup levels must be set. The ROD identified two COCs for human health in soil, as shown in **Table 1-1**. No chemicals of potential ecological concern were identified. The remedy selected in the ROD included excavation and off-site disposal of soil. The human health cleanup levels were set at concentrations equal to the largest of the calculated TCEQ Risk Reduction Standard No. 3 (RRS3) industrial soil medium-specific concentrations (MSC) based on the site-specific soil standard for groundwater protection, and background soil concentration (AECOM 2013). These cleanup levels are shown in **Table 1-1**.

Table 1-1
Chemicals of Concern and Cleanup Levels for LHAAP-03

Medium	Chemicals of Concern (Human Health)	Cleanup Levels [a]
Soil	Arsenic	5.9 mg/kg
	Lead	180 mg/kg

Notes:

[a] Applicable RRS3 Industrial Soil MSC equals largest of the calculated RRS3 MSC and background values. Italicized text indicates the cleanup level equals background

mg/kg milligrams per kilogram

1.3 Selected Remedy

The Final LHAAP-03 ROD (Bhate 2018a), signed by the Army and USEPA, selected excavation and off-site disposal as the remedy for arsenic and lead-contaminated soil at LHAAP-03, as summarized in Section 1.4 of the Final ROD. Following remedial action, COC concentrations were reduced to achieve chemical-specific applicable or relevant and appropriate requirements (based on the commercial/industrial land use scenario). The remaining arsenic and lead concentrations in soil do not pose an unacceptable direct contact risk to humans or ecological receptors at this site. 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 maximum contaminant levels for arsenic and lead.

The target soil remediation area for LHAAP-03 was 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 was to

address the LHAAP-03 groundwater remedy and LUCs as being indistinguishable from and included with the LHAAP-35A (58) remedy. This was accomplished with the approval of an Explanation of Significant Differences for the LHAAP-35A (58) ROD (Bhate 2018b).

Because LHAAP-03 lies wholly within the LUC boundary of LHAAP-35A (58), 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 (Shaw 2010, Bhate 2018b). Therefore, the remedy selected for LHAAP-03 does not include any specific provisions for LUCs (Bhate 2018a). CERCLA Five Year Reviews for LHAAP-03 will be addressed as part of LHAAP-35A (58). All monitoring and reporting requirements associated with CERCLA Five Year Reviews will be met under LHAAP-35A (58) (Bhate 2018b).

The ROD (Bhate 2018a) identified three areas to be excavated based on previous soil sample exceedances from 2006 through 2008. The excavation areas were refined in the RD/RAWP (Bhate 2019) based on the results of pre-design soil sampling conducted in 2018 and were described in the RD/RAWP as follows:

- **Area A.** This area was split into two subareas from the ROD Area A, Area A1 and Area A2, as shown on **Figure 1-3**.
  - For Area A1, the excavation area was developed by surrounding the locations that were above the RRS3 MSC at 0 to 0.5 feet below ground surface (bgs) and extending the horizontal limit to within 5 feet of sample locations that had results below the RRS3 MSCs at 0 to 0.5 or 0 to 2 feet bgs. An initial excavation depth of 1 foot was planned since none of the 0 to 2 feet bgs November 2018 samples were above the RRS3 MSC.
  - For Area A2, the contamination was isolated at 0 to 0.5 feet bgs, and a small excavation was planned around it. The estimated horizontal area is depicted on **Figure 1-3**, and the initial vertical excavation depth was 1-foot bgs.
- **Area B.** This area was defined in the ROD as a square excavation 5-feet-wide by 7-feet-deep. The area has been redefined by the sample results to a triangular area, as shown on **Figure 1-3**. The initial vertical excavation depth was 8 feet bgs.
- **Area C.** This area has remained unchanged from the ROD and was planned to be excavated as an 8-foot by 8-foot-square excavation, approximately 8-feet-deep centered around monitoring well 03WW01.

1.4 Deviation from RD/RAWP

The RD/RAWP (Bhate 2019) proposed using data collected in 2008 and 2018 in lieu of confirmation sampling around Excavation Area C (**Figure 1-3**). During the mobilization and staking of the excavation areas in the field by a licensed professional surveyor (Collins Surveying), it was determined that monitoring well 03WW01 was not in the location depicted on the figures in the RD/RAWP, but instead was located approximately 18 feet south-southeast of the location shown on the map. A review of field documentation from the 2006–2008 timeframe and historical surveying data, as well as a new survey of the 03WW01 location in September 2019, confirmed that the location of 03WW01 was not the same as the location of soil boring 03SB11, where soil contamination was found at 6 to 7 feet bgs in December 2007. In November 2008, deeper soil samples were collected from the location believed to be 03SB11 and monitoring well 03WW01 was installed at that location. Based on the review of the historical info and the recent re-survey, the November 2008 sampling location identified as 03SB11/03WW01 is approximately 18 feet south-southeast of the 03SB11 location that was sampled in December 2007. This created an issue with planned Excavation Area C, which was previously believed to be delineated by samples from two soil borings (03SB22 and 03SB28) drilled in November 2018, because those borings were drilled adjacent to 03WW01, and not the actual 2007 location of 03SB11 where the 6 to 7 feet bgs soil contamination was found.

In an email transmitted to the TCEQ and USEPA on September 30, 2019, the discrepancy was identified between the 2008 03WW01 and 2007 03SB11 locations and proposed to collect a 5-point composite floor sample and a 4-wall composite sample from Area C, excavated around the 2007 03SB11 location, instead of relying on the 2008 and 2018 samples to act as confirmation samples. Further, to confirm that there was not contamination present at the 03WW01 location, an additional sample was proposed to be collected from 6 to 7 feet bgs adjacent to 03WW01. USEPA and TCEQ approved the proposed approach via email on October 1, 2019.

1.5 Document Organization

This document is composed of the following sections:

- **Section 1.0, Introduction**, summarizes the site background, proposed remedy, RAOs, and deviations from the RD/RAWP.
- **Section 2.0, Soil Excavation**, summarizes the activities performed to execute the soil removal described in the RD/RAWP.
- **Section 3.0, Confirmation Sampling**, summarizes the results of prior soil borings as well as the samples collected following completion of excavation activities to

confirm that all of the contaminated soil in the planned excavation areas was successfully removed.

- **Section 4.0, Waste Disposal and Backfilling**, describes the activities performed to properly dispose of the excavated soil and the water that was pumped from the excavations and to replace the excavated soil with backfill.
- **Section 5.0, References**, provides citations for the documents used as references.

This report also includes the following appendices supporting the main text:

- **Appendix A** includes a photographic log documenting the excavation and backfilling activities.
- **Appendix B** includes the Analytical Data Reports for the 2019 and 2020 excavation confirmation, waste characterization, and backfill source samples.
- **Appendix C** includes the analytical data quality control summary report for the 2018, 2019, and 2020 analytical data.
- **Appendix D** includes the load tickets for the backfill soil.
- **Appendix E** includes the Nonhazardous Waste Disposal Manifests from the soil taken to the landfill and the disposal documentation for the water pumped from Excavation Area C.

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Draft Final • Rev 0 • April 2021

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Draft Final • Rev 0 • April 2021

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2.0 SOIL EXCAVATION

2.1 Excavation Field Activities

This section describes the excavation field activities completed atLHAAP-03, including:

- Mobilization and Site Setup
- Soil Excavation and Disposal

In general, the field activities were conducted in accordance with the RD/RAWP (Bhate 2019) and the Installation-Wide Work Plan (IWWP) for LHAAP (Bhate 2018c), except as noted in **Section 1.4**.

2.1.1 Mobilization and Site Setup

Prior to the mobilization of subcontractors to LHAAP sites, work locations for overhead and ground level accessibility were cleared with a brush hog to allow equipment access. After coordinating with underground utility locators for utility clearances, the excavation areas were located and staked by Collins Surveying, a Texas Professional Land Surveyor. Utility location and clearance for intrusive activities was conducted in accordance with Section 3.1 of the IWWP (Bhate 2018c). Prior to beginning the excavation, it was noted that the location of Area C as staked by the surveyors did not encompass monitoring well 03WW01, as shown on the maps from the RD/RAWP. As described in **Section 1.4**, it was determined that the 03SB11 soil samples from 2007 and the 2008 soil samples from the boring that was converted to 03WW01 were not at the same location. Following review of the historical records and resurveying of 03WW01 to confirm the locations, the Area C location around the 2007 03SB11 location was confirmed as the correct location for excavation.

An excavator operator and a sampling technician mobilized to the site on October 1, 2019 and placed 6-mil HDPE plastic sheeting down adjacent to the planned excavation areas to allow for stockpiling of excavated soil. A backhoe was mobilized for performing the excavation.

2.1.2 Soil Excavation and Disposal

The areas to be excavated were confirmed by the excavation personnel, and limits of excavation were physically marked with survey stakes and paint lines. The areas east and west of the excavation areas were cleared and prepared for use as temporary soil staging/stockpile areas. Excavation began on October 1, 2019, and the initial planned excavation areas were completed on October 2, 2019. The excavated soil was stockpiled in the prepared areas adjacent to the excavations. Confirmation samples were collected as discussed in **Section 3.0** and the excavated soil stockpiles were covered with plastic sheeting to protect against rainfall.

As further discussed in **Section 3.0**, a composite soil sample from all four walls of Area C was found to contain arsenic exceeding the LHAAP-03 cleanup value. While waiting for the confirmation samples to be analyzed, heavy rainfall occurred at LHAAP and stormwater runoff accumulated in the excavations. On October 24, 2019, water was pumped from Area C into 275-gallon totes that had contained emulsified vegetable oil used for bioremediation injections at LHAAP-16. The totes were staged at the LHAAP-18/24 groundwater treatment plant (GWTP) but were not run through the treatment plant due to concerns that the emulsified vegetable oil residue in the totes could disturb the operation of the treatment systems in the treatment plant. The area C walls were excavated by 2 feet in each direction, and individual composite samples were collected from each wall. The south wall was once again found to contain arsenic exceeding the cleanup value. However, prior to receipt of the results, rainfall once again filled the excavations with runoff and the area became inaccessible to heavy equipment. Periodic rainfall kept the site inaccessible through the remainder of 2019 and until July 2020.

Once the rainfall slowed enough and the site was dry enough to access the excavation areas, the excavation water from Area C was pumped into a clean poly tank and transported to the GWTP for disposal on August 4, 2020. The south wall of the excavation was extended another 5 feet and a composite sample from the south wall was collected. The sample result was below the cleanup goal and confirmed that the arsenic contamination had been removed. On August 10, 2020, the remaining water from clean areas A1, A2, and B was pumped out to the adjacent ground surface and all of the excavation areas were backfilled with clean fill as described in **Section 4.0**. A photographic log showing pictures from the excavation and backfill activities is included in **Appendix A**.

2.2 Excavation Areas

The excavation areas proposed in the RD/RAWP (Bhate 2019) to address the soil to groundwater pathway are shown on **Figures 2-1** and **2-2**. The excavation depths anticipated to remove the contaminated soil at various locations within the footprint of LHAAP-03 were 1-foot bgs (**Figure 2-1**) or 8 feet bgs (**Figure 2-2**). The areas were expanded during excavation based on the results from the confirmation samples described in **Section 3.0**. Groundwater is typically encountered at approximately 25 feet bgs in nearby monitoring well 03WW01 and was not encountered during the excavation activities.

Approximately 120 cubic yards of soil were excavated from Areas A, B, and C, between October 2019 and August 2020. The completed excavation areas are shown on **Figure 2-3**. The areas excavated were as follows:

- **Area A.** This area proposed in the ROD (Bhate 2018a) was reduced significantly in size and split into two subareas (Area A1 and Area A2) based on the results of the

November 2018 soil sampling reported in the RD/RAWP (Bhate 2019). Area A1 and Area A2 (**Figure 2-3**) were excavated as follows:

  – As discussed previously, Area A1 was developed by surrounding the locations that were above the RRS3 MSC at 0- to 0.5-foot bgs and extending the horizontal limit to within 5 feet of sample locations that had results below the RRS3 MSCs at 0 to 0.5 or 0 to 2 feet bgs. The excavation was completed to the planned 1-foot bgs depth. The COC concentrations in a composite floor confirmation sample were below the LHAAP-03 cleanup values as described further in **Section 3.0**.

  – For Area A2, the contamination was isolated at 0- to 0.5-foot bgs, and a small excavation to 1-foot bgs was completed to the planned limits. The composite floor and wall confirmation sample did not contain concentrations of COCs exceeding the LHAAP-03 cleanup values.

- **Area B.** This area proposed in the ROD (Bhate 2018a) as a square excavation 5-feet-wide by 7-feet-deep was redefined by the sample results reported in the RD/RAWP (Bhate 2019) to a triangular area, as shown on **Figure 2-3**. The area was excavated to a depth of 8 feet, and the composite floor confirmation sample did not contain COC concentrations exceeding the LHAAP-03 cleanup values.

- **Area C.** This area remained unchanged from the ROD (Bhate 2018a), but the locations of Area C and monitoring well 03WW01 were corrected, as described in **Section 1.4** and **Section 2.1.1,** due to a discrepancy identified in the field between the 2007 location of 03SB11 and the 2008 03SB11 sample location that was converted into monitoring well 03WW01. The excavation was centered on the 2007 location of 03SB11, where contamination was identified at 6 to 7 feet bgs and was initially excavated as an 8- by 8-foot-square excavation approximately 8-feet-deep (**Figure 2-3**). The floor confirmation sample did not contain COC concentrations exceeding the LHAAP-03 cleanup values. However, as described further in **Section 3.0**, the four-wall composite confirmation sample exceeded the cleanup value for arsenic. Following removal of rainwater accumulated in the excavation on October 12, 2019, a second four-wall composite sample was collected and again exceeded the cleanup value for arsenic. On October 24, 2019, following removal of rainfall runoff that accumulated in the excavation, Area C was overexcavated by approximately 2 feet in each direction. Individual confirmation samples collected on October 24, 2019, for the east, west, and north walls contained COCs below the cleanup values. The south wall sample contained arsenic exceeding the cleanup level. The south wall was excavated an additional 5 feet, and the confirmation sample collected on August 4, 2020, did not contain COC concentrations exceeding the LHAAP-03 cleanup values.

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3.0 CONFIRMATION SAMPLING

3.1 Confirmation Sampling Methodology

Upon completion of the excavation to the planned depth and extents discussed in **Section 2.0**, confirmation samples were collected to define the final excavation limits. If contamination was present in a confirmation sample, the excavation limits were extended vertically or horizontally and then resampled until confirmation samples were below the RRS3 MSC. In accordance with Section 4.4 of the RD/RAWP (Bhate 2019), previously collected samples from soil borings were used to define the planned excavation extent. Confirmation samples were collected in accordance with the IWWP (Bhate 2018c), except where deviations were noted in the RD/RAWP. For excavations where the limits were set by existing samples below the RRS3 MSC, no additional confirmation samples were collected.

Excavation wall and floor samples from the 1-foot-deep excavations were collected using a small trowel decontaminated between each use to gather five separate grab samples that were combined to create the composite sample. Wall and floor composite samples from the 8-feet-deep excavations were collected using the backhoe bucket. Each sample location was numbered sequentially in order of collection, labelled on a map, and identified using the following nomenclature:

03WFXXX-ZZ-YYMMDD or 03FLXXX-ZZ-YYMMDD

The number 03 represents the site (LHAAP-03); WF indicates that it is small excavation with composite of both the wall and floor, WL indicates a sidewall sample, while FL indicates a floor sample; XXX represents the unique sample number; ZZ indicates excavation sidewall height or the average depth below ground surface of the excavation floor; and MMDDYY is the date of sample collection. **Table 3-1** summarizes the samples (existing and planned) used for excavation confirmation.

3.2 Excavation Area Summary

Excavation Area A

Excavation Area A1. For Area A1, nine sample locations within 4 feet of the Area A1 excavation perimeter were used to indicate that the 0- to 1-foot bgs excavation sidewalls are clean. A single 5-point composite sample was collected from the floor (03FL001-01-191002) in accordance with the IWWP (Bhate 2018c).

Excavation Area A2. For Excavation Area A2, a single 5-point composite sample (03WF001-01-191002) was collected by combining grab samples from each of the four sidewalls and the floor.

Excavation Area B

Excavation Area B was delineated laterally based on previous samples (**Table 3-2**) and no post-excavation confirmation samples were needed from the excavation sidewalls. One composite sample was collected from the floor (03FL002-08-191002) and the results did not exceed the cleanup values.

Excavation Area C

For Area C, 03SB11 collected in 2007 had the highest concentrations of arsenic and lead detected at LHAAP-03 at the 6- to7-foot-interval. The 2018 samples collected to delineate the contamination at 03SB11 were not used for Area C confirmation because they were collected adjacent to the location of the 2008 03SB11/03WW01 location instead of the 2007 03SB11 location, as discussed in **Section 1.4**. Instead, a single post-excavation 4-point composite sample was collected by combining grab samples from each of the four excavation sidewalls (03WL001-06-07-191002) and a 5-point composite sample was collected from the floor (03FL003-08-191002). The composite sample of the walls contained arsenic above the cleanup level. Following removal of rainwater, an additional four-wall composite sample (03WL002-06-07-191012) also exceeded the arsenic cleanup value. Each wall was overexcavated approximately 2 feet and resampled separately with a 5-point composite sample (03WL-06-07-[WW1/EW1/NW1/SW1]-191024). The south wall composite sample contained arsenic above the cleanup level and the excavation was expanded by another 5 feet. The final sample collected from the south wall in August 2020 (03WL-6-7-SW2-200804) did not contain any COCs exceeding the cleanup levels.

Table 3-2 summarizes the arsenic and lead concentrations from the 2007, 2008, and 2018 soil boring samples, and 2019 and 2020 confirmation samples used to define the excavation extent. **Figure 3-1** depicts the analytical results for each of the samples used to define the excavation extent.

The analytical data packages for the 2019 and 2020 samples discussed in this report are included in **Appendix B**. The data packages included in **Appendix B** are U.S. Department of Defense (DoD) Stage 2A packages, prepared in accordance with the DoD)/U.S. Department of Energy (DoE) Consolidated Quality Systems Manual for Environmental Laboratories, Version 5.3 (DoD/DoE 2019). The Stage 2A (formerly called “Level II”) packages contain chain of custody forms, laboratory sample receipt forms, case narrative, sample results, sample quality control results, and method batch quality control results. DoD Stage 4 packages (DoD/DoE 2019) (formerly called “Level IV”) containing instrument quality control results, instrument calibration logs, instrument logs, sample preparation logs, and instrument raw data (chromatograms and mass spectral), in addition to the Stage 2A package information, were relied upon by the data reviewer to validate the analytical results. The Stage 4 packages will be placed in the LHAAP Administrative Record immediately following the final version of

this document. The Quality Control Summary Report for the 2018, 2019, and 2020 analytical data is included in **Appendix C**.

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4.0 BACKFILL AND WASTE DISPOSAL

4.1 Backfilling and Site Restoration

The excavation areas were backfilled on August 10, 2020 with approximately 120 cubic yards of native soil fill from the Moore Pit located approximately 6 miles east of Karnack, Texas. The fill was hauled to the site by Nash Trucking in 14-cubic yard dump trucks. Soil samples from the backfill pit were collected on August 13, 2019, and the results of samples collected are summarized in **Table 4-1**. A copy of the laboratory analytical data package for the backfill samples is provided in **Appendix B**. Load tickets for the backfill are included in **Appendix D**. The surface will be reseeded in the spring, if necessary, with a native grass and wildflower seed mixture selected in coordination with USFWS.

4.2 Waste Management

A composite sample (03SP001-191002) was collected on October 2, 2019, from the stockpiled soil following the initial excavation and analyzed for eight Resource Conservation and Recovery Act metals by USEPA Method 6020 using the Toxicity Characteristic Leaching Procedure. The separated stockpiles were combined in August 2020, and another sample was collected on August 6, 2020, for Total Petroleum Hydrocarbons analysis by Method TX1005 (03SoilStockpile-200806). The analytical results and historical information regarding the site were submitted to Waste Connections Inc. as a waste profile to obtain approval for disposal of the soil as nonhazardous waste at the East Texas Regional Landfill in Henderson, Texas.

Following receipt of approval and pre-filled out manifest forms from Waste Connections, the stockpiled soil waste was loaded into seven end dump trucks on September 30, 2020 and transported to the landfill for disposal. Copies of the signed and completed manifests from the landfill are included as **Appendix E**.

A sample of the water pumped from Excavation Area C into the totes containing emulsified vegetable oil residue in late October 2019 (LHAAP-03-IDW-201124), was collected on November 24, 2020, and analyzed for the following:

- Volatile organic compounds (Method 8260C)
- Semivolatile organic compounds (Method 8270C)
- Total petroleum hydrocarbons (Method TX1005)
- Pesticides (Method 8081B)
- Polychlorinated biphenyls (Method 8082A)
- Herbicides (Method 8151A)

- Texas 11 Metals (Methods 6020A and 7470A)
- Reactivity, conductivity, and ignitability for waste characterization

The historical information about the site and the water, as well as waste characterization data were provided to Waste Connections to obtain a profile for disposal. The water was pumped from the totes into a vacuum truck on January 29, 2021 and transported to the Waste Connection East Texas Regional Disposal Facility in Henderson, Texas, for disposal. A copy of the waste disposal documentation for the water is included in **Appendix E**.

4.3 Future Action and LUC Implementation

In accordance with the Final ROD (Bhate 2018a), groundwater monitoring for LHAAP-03 is being conducted as part of the LHAAP-35A (58) remedial action operation. No further sampling or monitoring is planned as part of the LHAAP-03 remedy. LUCs for LHAAP-03 were addressed in the Explanation of Significant Differences to the LHAAP-35A (58) ROD and have been implemented under the LHAAP-35A (58) remedial action. Monitoring of the LUCs will continue as part of the LHAAP-35A (58) remedial action, and no further LUC implementation or monitoring is required for the LHAAP-03 soil excavation remedial action.

5.0 REFERENCES

AECOM Technology Corporation (AECOM). 2013. *Final Remedial Investigation – Focused Feasibility Study for LHAAP-03 (Former Waste Collection Pad near Building 722-P Paint Shop), Longhorn Army Ammunition Plant*. March.

Bhate Environmental Associates, Inc. (Bhate). 2018a. *Final Record of Decision, LHAAP-03, Former Waste Collection Pad, Building 722-P Paint Shop, Longhorn Army Ammunition Plant, Karnack, Texas*. June.

Bhate. 2018b. *July 2018 Final, Explanation of Significant Differences, LHAAP-35A (58), Shops Area, Group 4 Record of Decision dated September 2010, Longhorn Army Ammunition Plant, Karnack, Texas*. July.

Bhate. 2018c. *Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas*.

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Tables

Table 3-1
Confirmation Sample Summary

Excavation Area	Excavation Depth (feet)	Total Volume (CY)	Floor Area (square feet)	Existing Sidewall Samples	Existing Floor Samples	Confirmation Samples Collected
A1	1	12	300	03SB18, 03SB12, 03SB25, 03SB24, 03SB23, 03SB28, 03SB27, 03SB15, 03SB26	None	1 floor
A2	1	1	25	None	None	1 composite of four sidewalls and floor
B	8	8	25	03SB15, 03SB19, 03SB26	None	1 floor
C	8	61	204	None	None	2 composite samples of four walls, 1 composite from floor [2], and 5 additional stepout composite wall samples.
03WW01 [1]	7	N/A	N/A	None	None	1 soil sample from 6-7 feet bgs to confirm 03WW01 area was not contaminated
					Total # Samples Collected	3 floor samples, 2 composite samples of 4 walls, 1 composite sample for small excavation, 5 composite wall samples, and 1 soil sample from 03WW01 area.

Notes:

[1] - See discussion in Section 1.4 regarding the location of 03WW01 relative to the December 2007 location of 03SB11

[2] - The initial 4 wall composite from Area C contained arsenic exceeding the cleanup level. Therefore, separate composite wall samples were collected from each wall following overexcavation, followed by an additional composite sample from the south wall stepout.

bgs - below ground surface

CY - cubic yards

Table 3-2
Confirmation Sample Analytical Results

Excavation Area			**Area A1**													
Sample ID			**03FL001-01-191002**		**03SB12-(0-0.5)**		**03SB15-(0-0.5)**		**03SB18-0.0-2.0**		**03SB23-0.0-2.0**		**03SB24-0.0-2.0**		**03SB25-0.0-2.0**	
Sample Date			**10/2/2019**		**12/17/2007**		**12/17/2007**		**11/29/2018**		**11/29/2018**		**11/29/2018**		**11/29/2018**	
Depth (feet)			**0 - 1**		**0 - 0.5**		**0 - 0.5**		**0 - 2**		**0 - 2**		**0 - 2**		**0 - 2**	
Location Description:			**Area A1, Floor**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**	
Analyte	**Cleanup Level**	**Units**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**
Metals by Method SW6020A																
Arsenic	5.9	mg/kg	2.34		1.84	J	3.84		1.56		1.93		1.66		1.42	
Lead	180	mg/kg	13.4		19.6		150		6.15		12.3		14.3		8.02	

Notes:

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL - Maximum Contaminant Limit

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

mg/kg - milligrams per kilogram

Val Qual - validation qualifier

ID - indentification

Table 3-2
Confirmation Sample Analytical Results

Excavation Area			**Area A1**						**Area A2**		**Area B**					
Sample ID			**03SB26-0.0-2.0**		**03SB27-0.0-2.0**		**03SB28-0.0-2.0**		**03WF001-01-191002**		**03FL002-08-191002**		**03SB19-0.0-2.0**		**03SB19-3.0-4.0**	
Sample Date			**11/29/2018**		**11/29/2018**		**11/29/2018**		**10/2/2019**		**10/2/2019**		**11/29/2018**		**11/29/2018**	
Depth (feet)			**0 - 2**		**0 - 2**		**0 - 2**		**0 - 1**		**8**		**0 - 2**		**3 - 4**	
Location Description:			**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A1, Soil Boring Sample Used for Sidewall Confirmation**		**Area A2, Wall and Floor Composite**		**Area B, Floor**		**Area B, Soil Boring Sample Used for Sidewall Confirmation**		**Area B, Soil Boring Sample Used for Sidewall Confirmation**	
Analyte	**Cleanup Level**	**Units**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**
Metals by Method SW6020A																
Arsenic	5.9	mg/kg	5.83		1.41		1.59		3.38		3.58		2.63		1.14	
Lead	180	mg/kg	8.6		8.66		8.27		75.5		8.04	J	9.52		7.89	

Notes:

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL - Maximum Contaminant Limit

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

mg/kg - milligrams per kilogram

Val Qual - validation qualifier

ID - indentification

Table 3-2
Confirmation Sample Analytical Results

Excavation Area			Area B											
Sample ID			03SB19-6.0-7.0		03SB26-3.0-4.0		03SB26-6.0-7.0		03SB27-3.0-4.0		03SB27-6.0-7.0		03SB27-8.0-9.0	
Sample Date			11/29/2018		11/29/2018		11/29/2018		11/29/2018		11/29/2018		11/29/2018	
Depth (feet)			6 - 7		3 - 4		6 - 7		3 - 4		6 - 7		8 - 9	
Location Description:			Area B, Soil Boring Sample Used for Sidewall Confirmation		Area B, Soil Boring Sample Used for Sidewall Confirmation		Area B, Soil Boring Sample Used for Sidewall Confirmation		Area B, Soil Boring Sample Used for Sidewall Confirmation		Area B, Soil Boring Sample Used for Sidewall Confirmation		Area B, Soil Boring Sample Used for Sidewall Confirmation	
Analyte	**Cleanup Level**	**Units**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**
Metals by Method SW6020A														
Arsenic	5.9	mg/kg	2.99		0.74		2.94		2.84		5.02		2.33	
Lead	180	mg/kg	5.71		4.14		6.96		7.36		7.29		4.67	

Notes:

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL - Maximum Contaminant Limit

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

mg/kg - milligrams per kilogram

Val Qual - validation qualifier

ID - indentification

Table 3-2
Confirmation Sample Analytical Results

Excavation Area			Area C													
Sample ID			03FL003-08-191002		03WL001-06-07-191002		03WL002-06-07-191012		03WL-06-07-EW1-191024		03WL-06-07-WW1-191024		03WL-06-07-NW1-191024		03WL-06-07-SW1-191024	
Sample Date			10/2/2019		10/2/2019		10/12/2019		10/24/2019		10/24/2019		10/24/2019		10/24/2019	
Depth (feet)			8		6 - 7		6 - 7		6 - 7		6 - 7		6 - 7		6 - 7	
Location Description:			Area C, Floor		Area C, Four Wall Composite		Area C, Four Wall Composite		Area C , East Wall		Area C, West Wall		Area C, North Wall		Area C, South Wall	
Analyte	**Cleanup Level**	**Units**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**	**Result**	**Val Qual**
Metals by Method SW6020A																
Arsenic	5.9	mg/kg	2.77		**6.33**		**7.84**	J	4.9		4.96		5.1	J	**6.39**	
Lead	180	mg/kg	9.43		8.96		12.3	J	9.95		20.1		20.5	J	10.1	

Notes:

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL - Maximum Contaminant Limit

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

mg/kg - milligrams per kilogram

Val Qual - validation qualifier

ID - indentification

Table 3-2
Confirmation Sample Analytical Results

	Excavation Area	Area C		Adjacent to 03WW01	
	Sample ID	03WL-6-7-SW2-200804		03SB29-06-07-191002	
	Sample Date	8/4/2020		10/2/2019	
	Depth (feet)	6 - 7		6 - 7	
	Location Description:	Area C, South Wall		Adjacent to 03WW01	
Analyte	**Cleanup Level**	**Units**	**Result**	**Val Qual**	**Result**	**Val Qual**
Metals by Method SW6020A						
Arsenic	5.9	mg/kg	2.23		1.78	
Lead	180	mg/kg	9.01		7.97	

Notes:

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL - Maximum Contaminant Limit

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

mg/kg - milligrams per kilogram

Val Qual - validation qualifier

ID - indentification

Table 4-1
Backfill Source Analytical Results

Location	Aluminum (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Vanadium (mg/kg)	Perchlorate (µg/kg)	VOCs	Explosives	2,3,7,8-TCDD (mg/kg)
Moore Pit										
BS-3	5,610	4.18	32.3	11.8	4.29	26	11 U	ND	ND	7.49×10^{-7} U
BS-5	11,500	5.91	11.2	16.3	6.37	42.9	11 U	ND	ND	1.09×10^{-6} U
Cleanup Values	*25,800* [a]	*7.9* [b]	*200* [c]	*38.6* [a]	*180*	*72* [c]	*7.2* [c]	*NV*	*NV*	*1.7×10^{-2}* [d]

Notes:

[a] The Cleanup Value shown is the 95% Upper Tolerance Limit (UTL) from the 2004 Final Background Study for LHAAP

[b] The Cleanup Value shown is from from Table 1-1 of the LHAAP-03 RD/RAWP (Bhate, 2019)

[c] The Cleanup Value shown is the Risk Reduction Standard Number 2 Groundwater Protective (GWP) soil concentration for non-residential land use

d The Cleanup Value shown is the Tier 1 Texas Risk Reduction Program soil to groundwater Protective Concentration Level for soil at non-residential sites.

Bold - Exceeds the RRS2 GWP-Ind or the LHAAP 95% UTL Background value

ND - No analyte in the analyte list was detected above the applicable limit of detection

NV - No Cleanup Value is shown for VOCs or Explosives because all analytes were below their applicable limit of detection

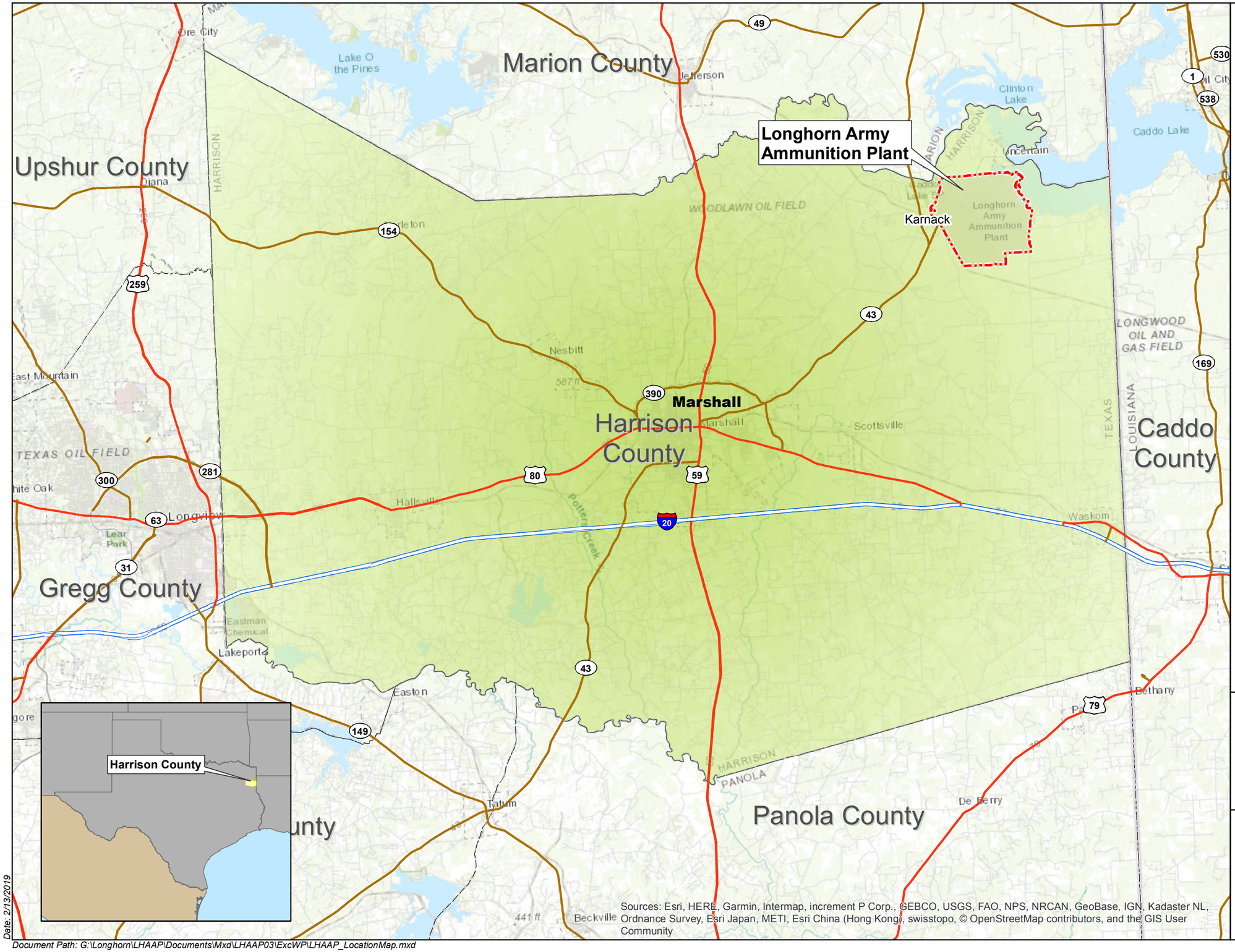
mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

VOCs - Volatile organic compounds

2,3,7,8-TCDD - tetrachlorodibenzo-p-dioxin

Figures



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

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Figure 1-1

LHAAP Location Map
LHAAP-03

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/13/2019

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP03\ExcWP\LHAAP_LocationMap.mxd

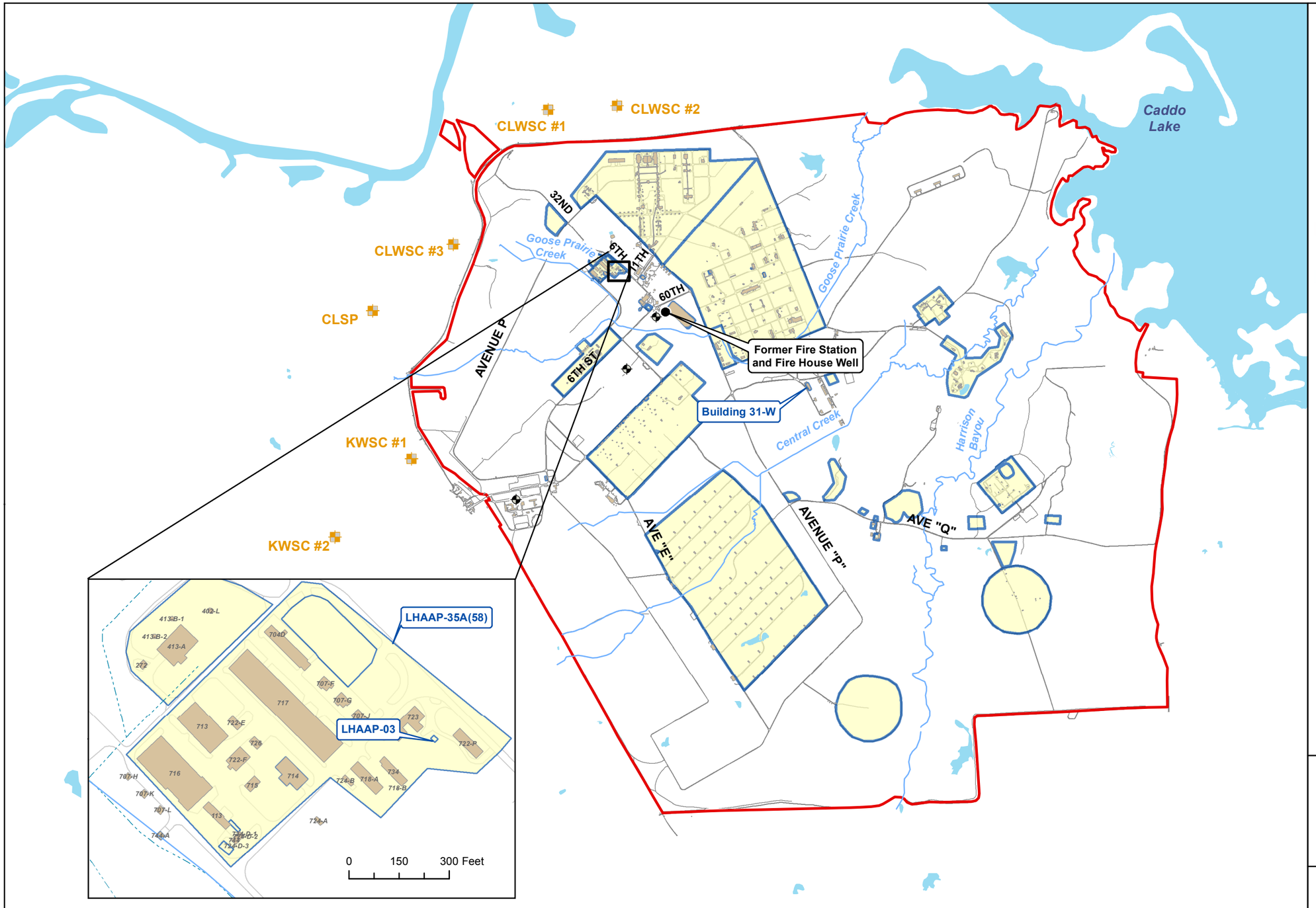

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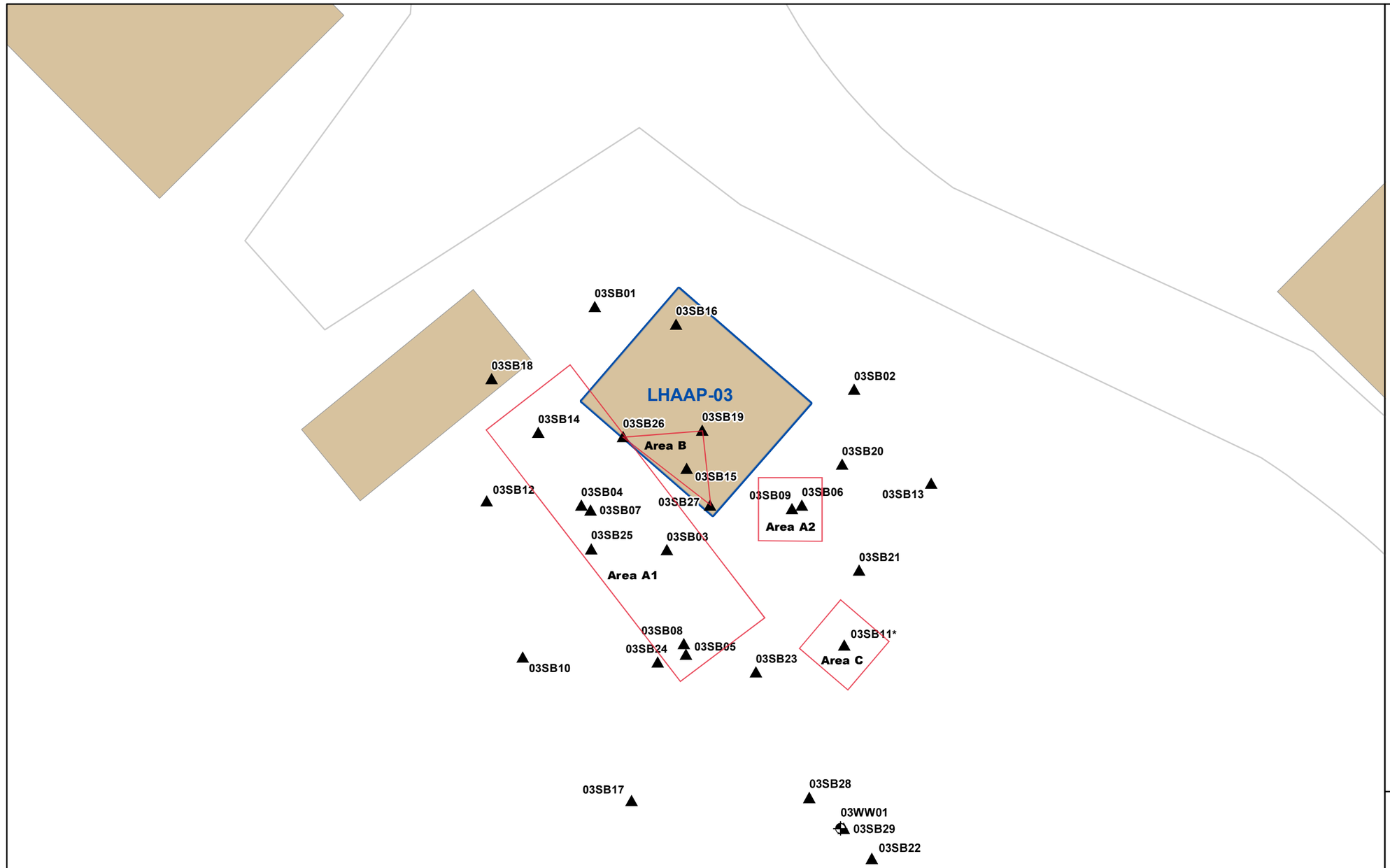
Figure 1-2

Site Location Map
LHAAP-03

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

\\usgrn1vfp001\data\group\G:\Longhorn\LHAAP\Documents\Mxd\LHAAP03\ExcWP\LHAAP-03 Site Location Map.mxd



Soil Boring
Excavation Area
Shallow Monitoring Well
Roads
Former Buildings/Structures
Site Boundary

Note:
1. bgs - below ground surface
2. RRS3 MSCs - Risk Reduction Standard 3 Medium-specific Concentrations

* 03SB11 sample intervals from 9-10 feet bgs and 14-15 feet bgs were below RRS3 MSC

N

0 5 10 Feet

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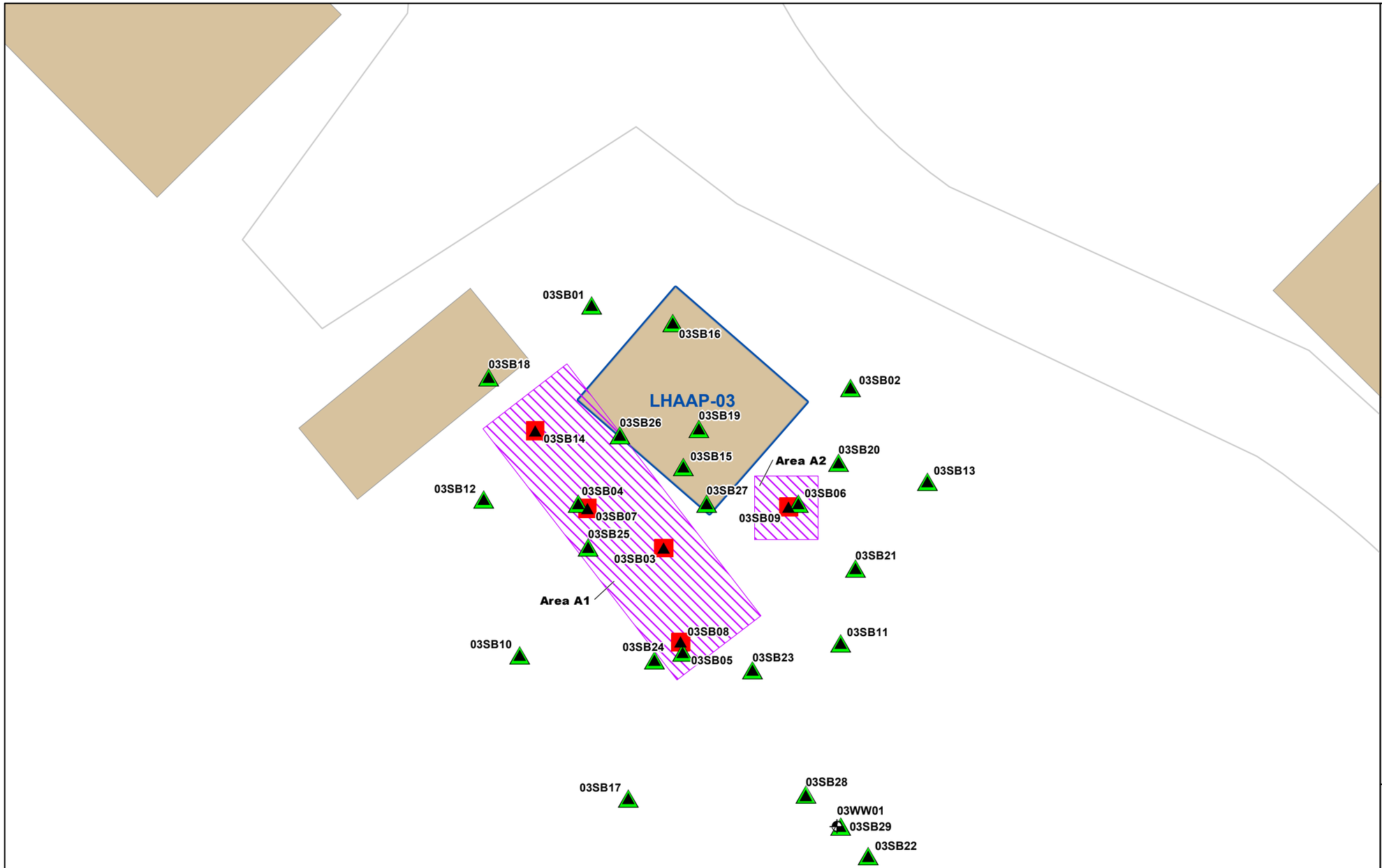
Figure 1-3

Planned Excavation Areas
LHAAP-03

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/28/2019

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP03\ExcWP\LHAAP03_Prop_EightFeet_ExcavationArea.mxd



Soil Boring

0-0.5 or 0-2 foot bgs
Sample below RRS3 MSC

0-0.5 foot deep soil contamination
above RRS3 MSC to be removed

1 ft Excavation Depth

Roads

Buildings

Site Boundary

Note:
1. bgs - below ground surface
2. RRS3 MSCs - Risk Reduction Standard 3 Medium-specific Concentrations

N

0 5 10 Feet

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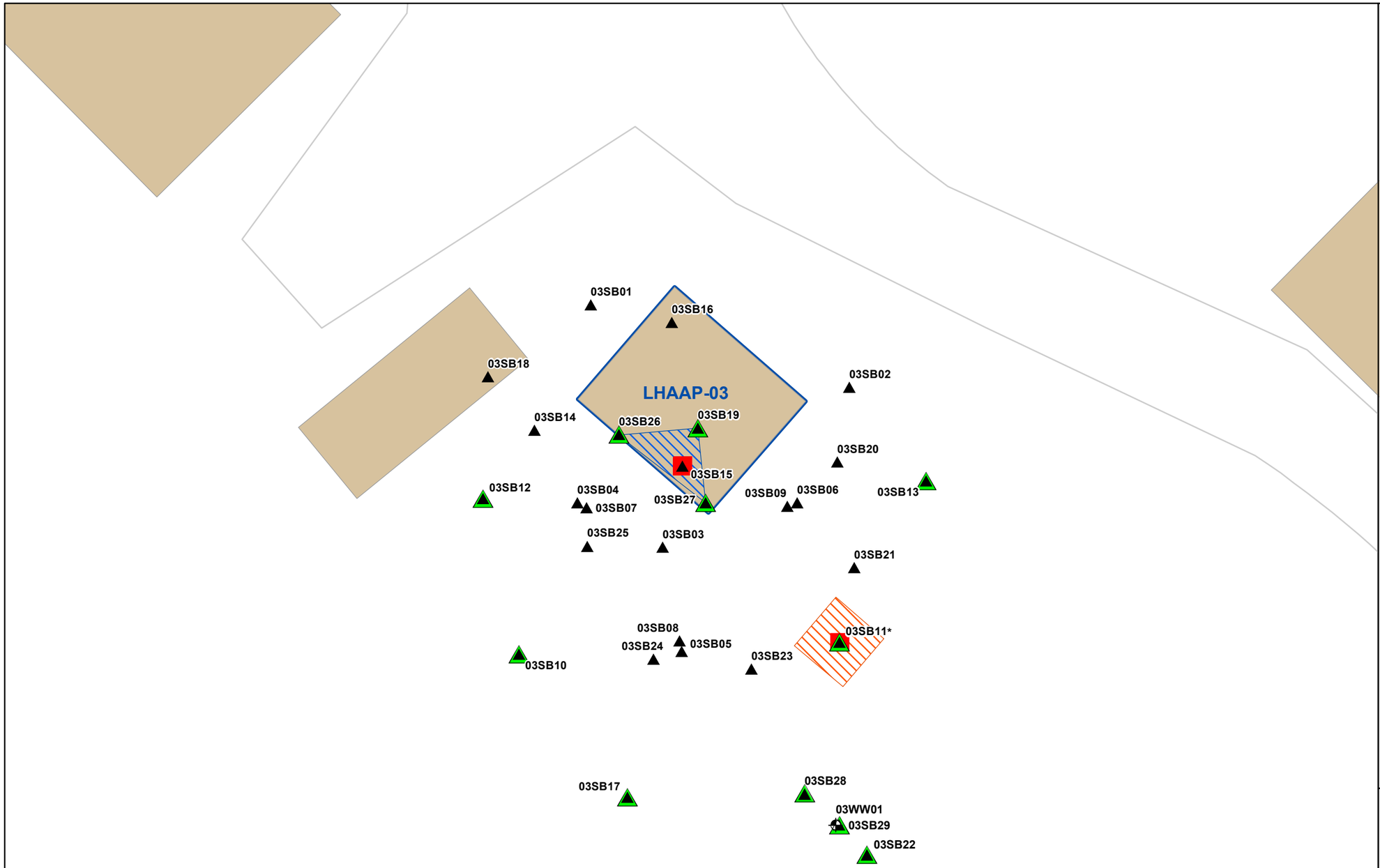
Figure 2-1

Planned 1-Foot Excavation Areas
LHAAP-03

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/28/2019

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP03\ExcWP\LHAAP03_Prop_ TwoFeet_ExcavationArea.mxd



6-7 foot deep soil contamination above RRS3 MSC to be removed

Below Cleanup Level at 6-7 ft bgs

Soil Boring not Sampled at 6-7 ft bgs

Area B (Excavation 8 feet bgs)

Area C (Excavation 8 feet bgs)

Shallow Monitoring Well

Roads

Former Buildings/Structures

Site Boundary

Note:
1. bgs - below ground surface
2. RRS3 MSCs - Risk Reduction Standard 3 Medium-specific Concentrations

* 03SB11 sample intervals from 9-10 feet bgs and 14-15 feet bgs were below RRS3 MSC

N

0 5 10 Feet

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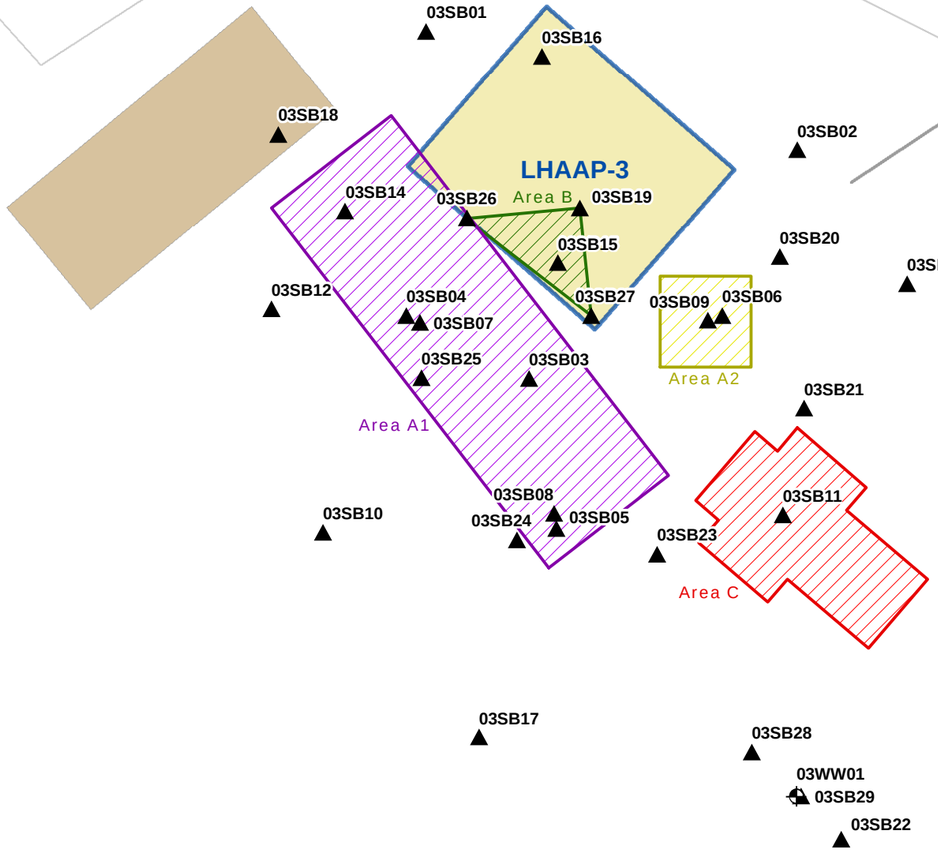
Figure 2-2

Planned 8-Foot Excavation Areas
LHAAP-03

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/28/2019

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP03\ExcWP\LHAAP03_Prop_EightFeet_ExcavationArea.mxd



Shallow Monitoring Well
Soil Sample Location
Roads
Site Boundary
Former Buildings/Structures

Excavation Area

Area A1
Area A2
Area B
Area C

N

0 5 10 Feet

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Figure 2-3

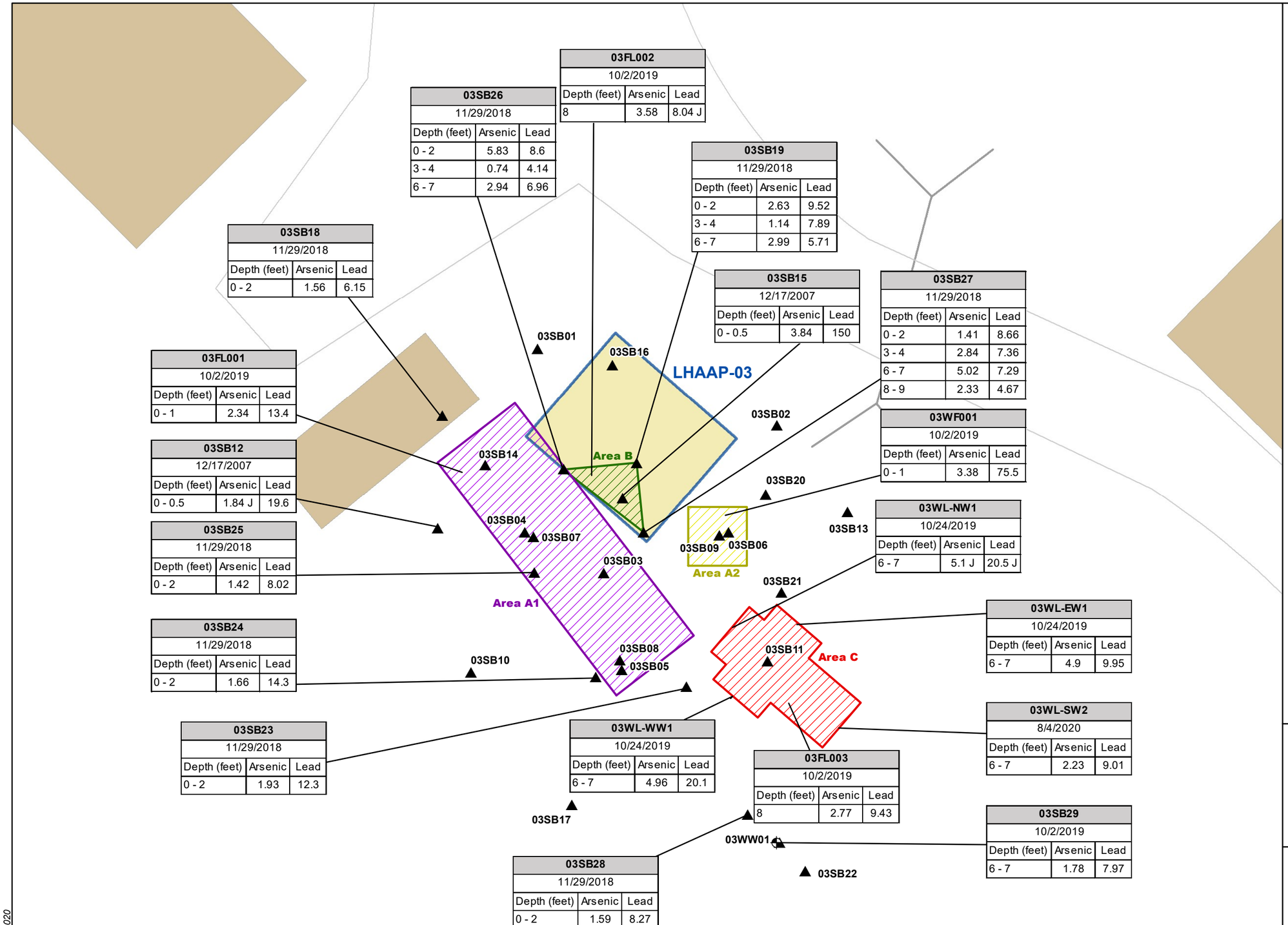
Completed Excavation Boundaries

LHAAP-03
Remedial Action Completion Report

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 12/14/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP03\RACR\CompletedExcavationBoundaries.mxd



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TULSA, OKLAHOMA

bhate APTIM

Figure 3-1

Confirmation Sampling Summary

LHAAP-03
Remedial Action Completion Report

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 12/14/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP03\RACR\ConfirmationSampling.mxd

Appendix A

Photographic Log

Appendix A – Photographic Log

Areas Surveyed and Ready to Begin Excavation (October 2019)

Excavating Area A1 (October 2020)

Appendix A – Photographic Log

Excavating Area C (October 2019)

Excavation Area A1 Complete with Soil Stockpiled in Background (October 2019)

Appendix A – Photographic Log

Excavating Area C with Area B in Foreground and 03SB29 Test Pit in Background (October 2019)

Test Pit Used to Collect Sample 03SB29-06-07-191002 (October 2019)

Appendix A – Photographic Log

Excavation Areas Complete, Fencing in Place, and Stockpiles Covered (October 2019)

Excavation Area C Extended Five Feet to Southeast (August 2020)

Appendix A – Photographic Log

Multiple Stockpiles Consolidated Near Road (August 2020)

Stockpiled Soil Loaded for Transport to East Texas Regional Landfill (September 2020)

Appendix A – Photographic Log

All Areas Backfilled and Stockpiled Soil Removed (September 2020)

Appendix B

Analytical Data Reports from 2019 and 2020 and Post-Excavation and Waste Characterization Samples

(Provided in separate PDF on CD and Portal)

Appendix C

Quality Control Summary Report for 2018, 2019, and 2020 Analytical Data

APPENDIX C

QUALITY CONTROL SUMMARY REPORT

ACRONYMS AND ABBREVIATIONS

%	percent
%D	percent difference
ALS	ALS Environmental Laboratories
CCV	continuing calibration verification
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
ICP	inductively coupled plasma
ICS	interference check sample
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHAAP	Longhorn Army Ammunition Plant
LOQ	limit of quantitation
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
QAPP	Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant, Karnack Texas: Appendix A: Standard Operating Procedures and Appendix B: Basewide Uniform Federal Policy-Quality Assurance Project Plan
QC	quality control
QCSR	quality control summary report
QSM	Quality Systems Manual
RACR	Remedial Action Completion Report
RPD	relative percent difference
RRF	relative response factor
SDG	sample delivery group
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbon
USACE	U.S Army Corps of Engineer
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1. INTRODUCTION

This Quality Control Summary Report (QCSR) describes the findings of the review of data for soil confirmation, borrow source, and stockpile sampling activities conducted from November 29, 2018 through August 6, 2020, and is provided to document the quality of the analytical data used in the *Remedial Action Completion Report, LHAAP-03 Former Pilot Waste Collection Pad, Building 722-P Paint Shop, Longhorn Army Ammunition Plant, Karnack Texas*. Sampling procedures and overall quality control (QC) and quality assurance protocols for the soil confirmation, borrow source, and stockpile sampling events are presented in the *Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant, Karnack Texas: Appendix A: Standard Operating Procedures and Appendix B: Basewide Uniform Federal Policy-Quality Assurance Project Plan* (QAPP) (Bhate Environmental, Inc. 2018).

This QCSR focuses on the data quality and usability of the samples collected from the following sampling events:

- November 2018 Pre-Excavation Soil Sampling
- August 2019 Borrow Source Sampling
- October 2019 Soil Confirmation and Stockpile Sampling
- August 2020 Soil Confirmation and Stockpile Sampling

All soil samples from the pre-excavation and confirmation sampling events were analyzed for the following parameters:

- Arsenic and Lead – U.S. Environmental Protection Agency (USEPA) Method 6020A

Borrow source samples were collected from Moore Pit source and analyzed for the following parameters:

- Volatile Organic Compounds (VOCs) – USEPA Method 8260C
- Semivolatile Organic Compounds (SVOCs) – USEPA Method 8270D
- Dioxins and Furans – USEPA Method 8290A
- Explosives – USEPA Method 8330A
- Metals – USEPA Methods 6020A/7471A
- Synthetic Precipitation Leaching Procedure Metals (arsenic, chromium, vanadium) – USEPA Methods 1312/6020A (Samples BS-2 and BS-7 only)
- Perchlorate – USEPA Method 6850

Stockpile samples were analyzed for :

- Total Petroleum Hydrocarbons (TPH) – State of Texas Method (TX) 1005
- Toxicity Characteristics Leaching Procedure Metals – USEPA Methods 1311/6020A/7470A

All soil, borrow source and stockpile samples were shipped to ALS Laboratories (ALS) in Houston, Texas. The analysis of perchlorate was performed by ALS in Salt Lake, Utah, while the remaining listed analyses were completed by the primary laboratory ALS in Houston, Texas. Throughout the project duration, ALS laboratories in both locations are accredited by the U.S. Department of Defense (DOD) and Department of Energy (DOE) Environmental Laboratory Accreditation Program and National Environmental Laboratory Accreditation Program (NELAP) in the State of Texas to perform the analyses.

Specific analyses performed for each sample and for each sampling event are presented on the table included as Attachment C-1. All analytical results from November 2018 through August 2020 sampling activities were received in sample delivery groups (SDG). Appendix A presents laboratory data packages. Attachment C-1 (provided at the end of this report) summarizes SDG numbers, sample numbers, sample locations, sample collection dates, preparation and analysis methods, preparation and analysis dates, and laboratories. An APTIM Federal Services, LLC (APTIM) project chemist manually performed Stage 2B data review on 100 percent of the soil, borrow source and stockpile sample results. The Stage 2B data review was performed in accordance with the guidelines and control criteria specified in the following documents:

- QAPP (Bhate 2018)
- *DOD/DOE Consolidated Quality Systems Manual for Environmental Laboratories, Version 5.1.1* (DOD/DOE 2018)
- *DOD/DOE Consolidated Quality Systems Manual for Environmental Laboratories, Version 5.3* (DOD 2019)
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846* (USEPA 1996)
- *USEPA Contract Laboratory Program, National Functional Guidelines for Organic Superfund Methods Data Review* (USEPA 2017a)
- *USEPA Contract Laboratory Program*, *National Functional Guidelines for Inorganic Superfund Methods Data Review*, *Final* (USEPA 2017b)
- *USEPA Contract Laboratory Program*, *National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (OCDD) and Chlorinated DibenzoFurans (CDFs) Data Review* (USEPA 2011)

The following QC elements were included in the Stage 2B data review:

- Sample preservation and sample extraction and analysis holding times
- Laboratory method blanks
- Initial and continuing calibration blanks (metals analysis only)
- Surrogate recoveries (organic analysis only)
- Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) recoveries
- Matrix spike (MS)/matrix spike duplicate (MSD) recoveries
- Post digestion spike recoveries (metals analysis only)
- Relative percent differences (RPD)
- Interference check sample (ICS) (Metals analysis only)
- Inductively coupled plasma (ICP) serial dilution (metals analysis only)
- Confirmation of positive results (explosives analysis only)
- Initial calibration and initial calibration verifications
- Continuing calibration verifications (CCV)
- Field duplicates
- Field blanks

Analytical data were reviewed in terms of precision, bias, representativeness, comparability, and completeness as follows:

- *Bias* is demonstrated by recovery of target analytes from fortified blank and sample matrices, LCS/LCSD, and MS/MSD, respectively. For organic methods, bias is also demonstrated through recovery of surrogates from each field and QC sample. The recovery of target analytes from fortified samples is compared with the acceptance criteria defined in the QAPP (Bhate, 2018) and DOD Quality Systems Manual (QSM). When the acceptance criteria are not available in the QAPP or DOD QSM, results are compared with the laboratory in-house control limits. When these criteria are not met, the data are qualified accordingly.
- *Precision* is expressed as the RPD between the results of replicate sample analyses: sample duplicates, LCSDs, and MSDs. When analyte RPDs exceed the acceptance criteria, the data are qualified accordingly.
- *Representativeness* of the samples submitted for analysis is ensured by adherence to standard sampling techniques and protocols.

- *Comparability* of sample results is ensured through the use of approved sampling and analysis methods.
- *Completeness* is expressed as a ratio of the number of usable data points to the total number of analytical data results.

The following sections present the Stage 2B data review findings. The discussion summarizes data quality exceedances and their potential impact on the quality and usability of analytical results. Attachment C-2 presents definitions of data qualification. Attachment C-3 summarizes the qualified data.

2. DATA QUALITY OUTLIERS

2.1 Sample Preservation and Sample Extraction and Analysis Holding Times (Reason Codes 02, 02A and 02B)

The sample coolers and samples contained within were received intact at the laboratory and were held within the required 0 to 6 degrees Celsius, and when required were chemically preserved in accordance with USEPA sample preservation requirements.

Sample holding times were evaluated by comparing the sample collection dates to the sample extraction and analysis dates. Extraction and analysis holding times were reviewed for all samples to determine the validity of the sample results. Backfill soil samples for VOC analysis were collected in Terra-Core Samplers and were preserved with methanol and sodium bisulfate. The analysis holding time for VOC analysis was extended from 48 hours to 14 days from the sample collection date. Stockpile soil samples for TPH analysis were collected in Terra-Core Samplers and kept frozen at the laboratory until analysis. The analysis holding time for TPH analysis was extended to 14 days when samples were temperature preserved. Extraction and analysis holding time requirements were achieved for all samples and for all analyses.

2.2 Laboratory Method Blanks (Reason Codes 06 and 06A)

The field sample results were evaluated with respect to the laboratory method blank prepared and analyzed for each analytical batch and for each analytical method. Positive analyte detections in a laboratory method blank were observed for dioxins and furans analysis. Specific contaminants, the detected levels, and the limits of quantitation (LOQ) are presented below:

SDG Number	Analysis Method	Laboratory Contaminant (ng/kg)	LOQ (ng/kg)	Data Qualification
E19000593	SW8290A	1,2,3,7,8-peCDD: 0.489	2.33	U
		1,2,3,4,7,8-HxCDD: 0.415	2.33	U
		1,2,3,6,7,8-HxCDD: 0.34	2.33	U
		1,2,3,7,8,9-HxCDD: 0.355	2.33	U
		1,2,3,4,6,7,8-HpCDD: 1.81	2.33	U
		OCDD: 17.6	4.67	U
		1,2,3,7,8-PeCDF: 0.38	2.33	U
		2,3,4,7,8-PeCDF: 0.512	2.33	U
		1,2,3,4,7,8-HxCDF: 0.412	2.33	U
		1,2,3,6,7,8-HxCDF: 0.343	2.33	U
		1,2,3,7,8,9-HxCDF: 0.606	2.33	U
		2,3,4,6,7,8-HxCDF: 0.502	2.33	U
		1,2,3,4,6,7,8-HpCDF: 2.19	2.33	U
		1,2,3,4,7,8,9-HpCDF: 0.729	2.33	U
		OCDF: 12.8	4.67	U
		Total Hexa Dioxins: 0.186	4.6	U
		Total Hepta Dioxins: 3.6	2.33	U
		Total Penta Furans: 0.512	3	U
		Total Hexa Furans: 0.502	6	U
		Total Hepta Furans: 3.34	3	U

Note:
ng/kg: nanograms per kilogram
peCDD: pentachlorodibenzo-p-dioxin
HxCDD: hexachlorodibenzo-p-dioxin
HpCDD: heptachlorodibenzo-p-dioxin
peCDF: pentachlorodibenzofuran
HxCDF: hexachlorodibenzofuran
HpCDF: heptachlorodibenzofuran
OCDF: octachlorodibenzofuran

Based on the DOD/DOE QSM requirements, laboratory method blank concentrations are considered acceptable when contaminant levels in the blank are less than one-half the LOQ for target analytes or less than the LOQ for common laboratory contaminants, such as acetone and methylene chloride. As shown above, the detected levels for the majority of the dioxins and furans were less than one-half the LOQ and thus met the blank acceptance criteria.

As a result of the trace level laboratory method blank contaminations, the detected results in sample processed with the laboratory method blanks were qualified as not detected (U) at the LOQs or reported values when sample concentrations were less than or equal to 5 times the level observed in the blanks. There is no impact on the data usability of the qualified data because of the low level laboratory blank detections. The blank qualification was not applied to sample results when target analytes were not detected in samples or when the concentrations of target analytes were above 5 times the levels reported in the method blank.

All laboratory method blanks were free of metals, VOCs, SVOCs, explosives, perchlorate, and TPH.

2.3 Initial and Continuing Calibration Blanks (Reason Code 06B)

In addition to the laboratory method blanks for metals analysis, initial and continuing calibration blank results were reviewed to ensure that the instrument was free of contamination prior to the analysis. All initial and continuing calibration blanks were free of metals.

2.4 Surrogate Recoveries (Reason Code 07)

Surrogate standards are organic compounds added to field and laboratory QC samples for organic analysis to evaluate the matrix effect and method performance on an individual sample basis. Surrogates in all samples analyzed for VOCs, SVOCs, and explosives were recovered within the established control criteria. Prior to analysis, labeled standards were spiked into each dioxins and furans sample and were recovered within the accuracy control limits.

2.5 Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries and Precisions (Reason Codes 11, 11A, and 11B)

The LCS is an aliquot of analyte-free matrix spiked with target analytes that is prepared with each analytical batch and for each analytical method. The recovery of target analytes from the LCS analysis is a measurement of method performance in an interference-free sample matrix. The review indicated that the LCS recoveries and precisions met the established QC requirements for metals, VOCs, SVOCs, explosives, dioxins and furans, perchlorate, and TPH analyses.

2.6 Matrix Spike/Matrix Spike Duplicate Recoveries and Precisions and Post Digestion Spike Recoveries (Reason Codes 08, 08A, and 08B)

The MS and MSD samples are a portion of a field sample spiked with target analytes that are prepared with each analytical batch and with each method. The MS/MSD results are used to evaluate any bias introduced to the method due to matrix interference, and to measure bias and precision for each analytical batch.

In accordance with the QAPP requirements (Bhate 2018), the MS/MSD samples are to be collected at a rate of 1 per 20 samples or 5 percent. During the November 2018 through August 2020 soil sampling events, seven MS/MSD samples were collected exceeding the 5 percent MS/MSD sample frequency goal:

SDG Number	Sample Number	MS/MSD Analysis
HS18120004	03SB27-3.0-4.0	Metals
	03SB21-0.0-2.0	Metals
HS19080691	BS-1-190813	Explosives, metals, SVOCs, perchlorate
HS19100210	03FL002-08-191002	Metals
HS19100915	03WL002-06-07-191012	Metals
HS19101604	03WL002-06-07-NW1-191024	Metals
HS20080131	03WL-6-7-SW2-200804	Metals

Noncompliant MS recoveries and/or precisions were reported for metals and SVOC analyses. Specific spiked sample numbers, MS recovery or precision outliers, and acceptance criteria are presented below:

SDG Number	Analysis Method	MS Sample Number	MS Recovery or Precision Outlier(%)	MS Control Limit (%)	Data Qualification
HS18120004	SW6020A	03SB21-0.0-2.0	Lead: acceptable/120	84-118	J+
HS19100210	SW6020A	03FL002-08-191002	Lead: 82/acceptable	84-118	J-
HS19100915	SW6020A	03WL002-06-07-191012	Arsenic: 133/167, RPD: 37	82-118, RPD: 20	J+
			Lead: 126/83	84-118	J+
HS19101604	SW6020A	03WL002-06-07-NW1-191024	Arsenic: 61/76	82-118	J-
			Lead: 28/31	84-118	J-
HS19080691	SW6020A	BS-1-190813	Aluminum: 23100/13500	78-124	None
			Antimony: 23/22	72-124	J-
			Arsenic: acceptable/81	82-118	J-
			Barium: 124/acceptable	86-116	J+
			Calcium: 85/84	86-118	J-
			Chromium: acceptable/80	83-119	J-
			Iron: acceptable/-336	81-124	None
			Manganese: acceptable/84	85-116	J-
			Potassium: acceptable/82	85-119	J-
			Selenium: acceptable/76	80-119	J-
			Vanadium: 184/149	82-116	None
			Zinc: 174/acceptable, RPD: 37	82-119, RPD 20	J+
HS19080691	SW8270D	BS-1-190813	2,4,6-Trichlorphenol: acceptable/127	39-126	None
			2,4-Dinitrophenol: acceptable/126	40-125	None
			2-Chloronaphthalene: 116/127	41-114	None
			3&4 Methylphenol: 158/158	34-119	None
			3-Nitroaniline: RPD: 31	RPD: 20	None
			4-Chloroaniline: RPD 41	RPD: 20	None
			4-Bromophenyl-phenyl-ether: 125/acceptable	46-124	None
			4-Chlorophenyl-phenyl-ether:125/125	45-121	None
			4-Nitrophenol: 139/141	30-132	None
			Caprolactam: 133/151	46-117	None
			Hexachlorobenzene: 132/130	45-122	None
			Hexachlorobutadiene: 143/138	32-123	None
			Hexachlorocyclopentadiene: 127/133	50-120	None
			Pentachlorophenol; acceptable/134	25-133	None

As a result of noncompliant MS recoveries and precisions, the results of the listed metals were qualified as estimated (J-/J+). This data qualification was applied to the results of the metals in the spiked samples only. As presented above, the majority of the MS recoveries did not significantly deviate from the lower or upper control limits, and therefore the data usability of the qualified data is not affected. The LCS results associated with the noncompliant batch were within control, which demonstrated that acceptable batch accuracy and precision were achieved for all metals samples in the batch.

In the spiked sample (BS-1-190813), the concentrations of aluminum, iron, and vanadium far exceeded 4 times their respective spiked levels. These elevated sample concentrations produced matrix interference, which affected the accuracy of the MS analysis. Because the parent concentrations were greater than 4 times the spiked levels, no data qualification was warranted.

Post-digestion spike analysis is performed when MS/MSD results for metals analysis are outside the established control range and when the parent sample concentrations are less than 4 times the spiked levels. The post-digestion spike data are used to further evaluate if matrix interference may introduce a bias in sample quantitation. The review indicated that post-digestion spike analysis was performed on all MS/MSD samples and that the recoveries were acceptable.

Also in the spiked sample (BS-1-190813), high biased MS recoveries or precisions were reported for 14 SVOCs. Since the listed SVOCs were not detected in the spiked sample, the MS recovery or precision outliers did not affect the data quality of the sample results and did not lead to any data qualification.

Except where noted above, all other MS results were acceptable.

2.7 Interference Check Samples (Reason Code 12)

The ICS verifies the inter-element and background correction factors. An ICS was analyzed at the required frequencies, and all ICS results were within the established control limit for the metals analysis.

2.8 ICP Serial Dilutions (Reason Code 13)

The ICP serial dilution determines whether significant physical or chemical interferences exist due to sample matrix. When the concentration of an analyte exceeds 50 times the method detection limit, an ICP serial dilution is performed at a five-fold dilution and the results between the original analysis and the diluted analysis are compared. The results of the ICP serial dilution are deemed acceptable when a percent difference (%D) between the original analysis and the diluted analysis is less than or equal to 10

percent. ICP serial dilutions were performed on the site specific soil samples and the ICP serial results were acceptable for all metals and for all samples.

2.9 Confirmation of Positive Results (Reason Codes D)

As required by the DOD/DOE QSM and USEPA, when samples are analyzed by either a gas chromatography or high-performance liquid chromatography method, all positive results, with the exception of TPH as gasoline, diesel and motor oil, must be confirmed by a second column or a different detector. As indicated in the laboratory reports, explosives were not detected in any borrow source samples, and therefore a second column confirmation analysis was not required.

2.10 Initial Calibration (Reason Codes 04, 04B, and 04C)

Instrument calibration is performed for VOCs, SVOCs, explosive, dioxins and furans, perchlorate, TPH, and metals analyses according to the USEPA method requirements (USEPA 1996). The linear analytical range is established for each method by analysis of calibration standards prepared at increasing concentrations that cover the expected sample concentrations. The acceptability of the initial calibration is determined by calculation of a percent relative standard deviation or coefficient. The initial calibration results were acceptable for all the listed analyses.

Immediately after the initial calibration for each analysis, initial calibration verification was conducted at the mid-point of instrument calibration range by using a second-source calibration standard to verify the accuracy of the initial calibration. The review indicated acceptable initial calibration verification results for all target compounds.

2.11 Continuing Calibration Verification (Reason Codes 05 and 05B)

Routinely during sample analysis, the stability of the analytical system is monitored by analysis of continuing calibration standards at concentrations near the mid-point of the instrument calibration range. The review indicated that CCVs were conducted at proper frequencies and that the percent recoveries between the standard concentrations and observed concentrations exceeded the acceptance criteria for metals as summarized below:

SDG Number	Analysis Method	CCV Number	CCV Outlier(%)	CCV Control Limit (%)	Data Qualification
HS19080691	SW6020A	CCV5	Aluminum: 124	90-110	J+
	SW6020A	CCV6	Aluminum: 127	90-110	J+
	SW6020A	CCV7	Aluminum: 111	90-110	J+

Due to the continuing calibration outliers, the detected results for aluminum in all samples associated with the calibration exceedances were qualified as estimated (J+). The data usability of the qualified data is not affected due to the minor calibration outliers.

For VOCs, SVOCs, dioxins and furans, perchlorate, and explosives analyses, %D values between the relative response factor (RRF) in the initial calibration and the RRF in the continuing calibration were also reviewed. Acceptable %D results were reported for all the listed analyses.

2.12 Trip Blanks (Reason Code 06D)

Trip blanks were prepared by the laboratory and stored with the groundwater samples collected for VOCs analysis. During November 2018 through August 2020 soil sampling activities, no groundwater samples were collected for VOC analysis, and therefore no trip blanks were required.

2.13 Equipment Rinse Blanks (Reason Code 06C)

Equipment rinse blanks are designed to check for contamination from sampling equipment, and the results for the equipment rinse blanks are used to evaluate the efficiency of equipment decontamination procedures.

In accordance with the QAPP requirements (Bhate 2018), no equipment rinse blanks will be collected when dedicated or disposable sampling equipment is used to collect soil or liquid samples. During the entire project duration, dedicated or disposable sampling equipment was used to collect soil samples. As no cross-contamination between samples could occur, no equipment rinse blanks were necessary in these cases.

2.14 Field Duplicates

In accordance with the QAPP requirements (Bhate 2018), field duplicate samples are to be collected at a minimum rate of 10 percent of the total number of soil samples. Field duplicate samples are evaluated by calculating the RPD between the parent sample and its duplicate. The RPD is calculated using the following equation:

$$RPD = |(S-D)/[(S+D)/2]| \times 100$$

Where:

S = sample result

D = duplicate result

Acceptable precision control criteria are established at less than or equal to 50 percent for soil samples. The RPD is calculated between pairs of field duplicate samples when both results are reported at or above the LOQ.

A total of 39 primary samples and 5 field duplicates were collected from the November 2018 Pre-Excavation Sampling Event, and October 2019 and August 2020 Soil Confirmation Sampling Events. The 10 percent field duplicate collection requirement was achieved. Field duplicates were collected using the same sampling technique and analyzed for the same analytical parameters as their associated parent samples, Attachment C-4 presents the field duplicate results. Field duplicate results exceeding the precision goal are also listed below:

- 03SB20-0.0-2.0: the RPD for arsenic at 89.8 percent
- 03SB22-3.0-4.0: the RPD for arsenic at 146.68 percent
- 03SB26-0.0-2.0: the RPD for arsenic at 100.9 percent
- 03WL-06-07-NW1-191024: the RPD for arsenic at 64.25 percent

The RPDs for lead in the 5 duplicate pairs ranged from 1.48 to 32.17 percent and met the field precision control requirement. The field RPDs for both arsenic and lead in one duplicate pair (03FL001-01-191002) were acceptable. As discussed in the previous sections, the LCSD RPDs for all metals in the laboratory clean sample matrix met the precision goals.

3. COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

The following sections present a discussion of technical completeness for the LHAAP-03 pre-excavation, soil confirmation, borrow source and stockpile sampling events. Completeness results are calculated for soil and field duplicate samples that are used for project decisions. Completeness results are presented in Attachment C-5.

3.1 Technical Completeness

Technical completeness is a quantitative measure of the data usability based on the number of rejected data compared to the total number of sample results. The technical completeness goal for each method is established at equal to or greater than 95 percent. The technical completeness calculation considers all data that are not rejected to be usable. The technical completeness is calculated as follows:

$$\% \text{ Technical Completeness} = \frac{\text{Number of Usable Results}}{\text{Total Number of Results}} \times 100$$

Despite the exceedances discussed in the previous sections, all qualified data is usable. The technical completeness was 100% for each method exceeding the 95 percent technical completeness objective. Therefore, the project data quality objectives were achieved for USEPA Methods 8260C, 8270D, 8290A, 8330A, 6020A, 7471A, 6850 and TX 1005 for the LHAAP-03 soil sampling events.

3.2 Representativeness and Comparability

During sampling, samplers followed the approved QAPP requirements (Bhate 2018) and established sampling standard operating procedures to collect, preserve, document, and ship samples to off-site laboratories, thus ensuring the representativeness of the soil samples collected for the sampling events.

Upon sample receipt, the laboratory reviewed sample conditions to ensure that sample containers, preservatives (when applicable), and requested analyses matched the chain-of-custody requirements. Discrepancies between the chain-of-custody forms and sample containers were brought to the attention of the APTIM project chemist and resolved prior to sample analysis.

ALS Laboratories are DOD and NELAP certified and adhered to the most current USEPA Methods, QAPP (Bhate 2018), and DOD/DOE QSM (DOD/DOE 2018 and 2019) requirements to prepare, analyze, and report the data. This ensures the comparability of the analytical results between different samples and different sampling events. APTIM project chemist performed Stage 2B data validation on 100 percent of

the analytical data obtained from the November 2018 through August 2020 sampling events to verify that the laboratories complied with the DOD/DOE QSM, QAPP, and method requirements. Analytical results that were outside the established QC requirements were qualified and the data quality and usability were discussed in the previous sections. Based on a review of the chain-of-custody forms, sample receipt forms, and laboratory data packages, the analytical data reported for LHAAP-03 soil sampling events has met the comparability requirements.

4. SUMMARY

The analytical data has been reviewed for precision, bias, representativeness, comparability, and completeness. With the exceptions of trace level laboratory method blank contamination, noncompliant MS recoveries and precisions and continuing calibrations, all other QC elements met their respective QC requirements. The results of dioixins and furans and metals in the affected samples were qualified as non-detected or estimated as a result of the QC exceedances. The 95 percent technical completeness goal was exceeded for all methods for all the sampling events. All data are usable for their intended purposes.

5. REFERENCES

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ATTACHMENTS

List of Attachments

Attachment C-1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

Attachment C-2: Data Qualification Flags

Attachment C-3: Qualified Data Summary

Attachment C-4: Summary of Field Duplicate Results

Attachment C-5: Technical Completeness

Attachment C-1: Summary of Sample Collected, Sample Date, Sample Location, and Analysis Method

SDG	Event	Sample Number	Sample Location	Sample Date	Sample Type	Matrix	Preparation Method	Preparation Date	Analytical Method	Analysis Date	Lab
HS18120004	2018 PreExcavation	03SB18-0.0-2.0	03SB18	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB26-0.0-2.0	03SB26	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB26-0.0-2.0-FD	03SB26	11/29/2018	FD	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB26-3.0-4.0	03SB26	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB26-6.0-7.0	03SB26	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
HS18120004	2018 PreExcavation	03SB19-0.0-2.0	03SB19	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB19-3.0-4.0	03SB19	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB19-6.0-7.0	03SB19	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB20-0.0-2.0	03SB20	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB20-0.0-2.0-FD	03SB20	11/29/2018	FD	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB20-3.0-4.0	03SB20	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB21-0.0-2.0	03SB21	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB21-3.0-4.0	03SB21	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB22-0.0-2.0	03SB22	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB22-3.0-4.0	03SB22	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB22-3.0-4.0-FD	03SB22	11/29/2018	FD	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB22-6.0-7.0	03SB22	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB23-0.0-2.0	03SB23	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB23-3.0-4.0	03SB23	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB25-0.0-2.0	03SB25	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB24-0.0-2.0	03SB24	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/14/2018	ALSHT
HS18120004	2018 PreExcavation	03SB27-0.0-2.0	03SB27	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
HS18120004	2018 PreExcavation	03SB27-3.0-4.0	03SB27	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
HS18120004	2018 PreExcavation	03SB27-6.0-7.0	03SB27	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
HS18120004	2018 PreExcavation	03SB27-8.0-9.0	03SB27	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
HS18120004	2018 PreExcavation	03SB28-0.0-2.0	03SB28	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
HS18120004	2018 PreExcavation	03SB28-3.0-4.0	03SB28	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
HS18120004	2018 PreExcavation	03SB28-6.0-7.0	03SB28	11/29/2018	REG	Soil	SW3050A	12/11/2018	SW6020A	12/12/2018	ALSHT
1923183	Borrow Source	BS-1-190813	BS-1	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-1-190813	BS-1	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/22/2019	ALSHT
HS19080691	Borrow Source	BS-1-190813	BS-1	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT

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SDG	Event	Sample Number	Sample Location	Sample Date	Sample Type	Matrix	Preparation Method	Preparation Date	Analytical Method	Analysis Date	Lab
HS19080691	Borrow Source	BS-1-190813	BS-1	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-1-190813	BS-1	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-1-190813	BS-1	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-1-190813	BS-1	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/18/2019	ALSHT
1923183	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	SW1312	08/27/2019	SW6020A	08/27/2019	ALSHT
HS19080691	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-2-190813	BS-2	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/18/2019	ALSHT
1923183	Borrow Source	BS-3-190813	BS-3	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-3-190813	BS-3	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-3-190813	BS-3	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-3-190813	BS-3	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-3-190813	BS-3	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-3-190813	BS-3	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-3-190813	BS-3	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/18/2019	ALSHT
1923183	Borrow Source	BS-4-190813	BS-4	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-4-190813	BS-4	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-4-190813	BS-4	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-4-190813	BS-4	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-4-190813	BS-4	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-4-190813	BS-4	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-4-190813	BS-4	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/18/2019	ALSHT
1923183	Borrow Source	BS-5-190813	BS-5	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-5-190813	BS-5	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/22/2019	ALSHT
HS19080691	Borrow Source	BS-5-190813	BS-5	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-5-190813	BS-5	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-5-190813	BS-5	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT

Attachment C-1: Summary of Sample Collected, Sample Date, Sample Location, and Analysis Method

SDG	Event	Sample Number	Sample Location	Sample Date	Sample Type	Matrix	Preparation Method	Preparation Date	Analytical Method	Analysis Date	Lab
HS19080691	Borrow Source	BS-5-190813	BS-5	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-5-190813	BS-5	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/18/2019	ALSHT
1923183	Borrow Source	BS-6-190813	BS-6	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-6-190813	BS-6	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-6-190813	BS-6	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-6-190813	BS-6	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-6-190813	BS-6	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-6-190813	BS-6	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-6-190813	BS-6	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/19/2019	ALSHT
1923183	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	SW1312	08/27/2019	SW6020A	08/27/2019	ALSHT
HS19080691	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-7-190813	BS-7	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/19/2019	ALSHT
1923183	Borrow Source	BS-8-190813	BS-8	08/13/2019	REG	Soil	METHOD	08/16/2019	SW6850	08/16/2019	ALSS
E1900593	Borrow Source	BS-8-190813	BS-8	08/13/2019	REG	Soil	METHOD	08/14/2019	SW8290A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-8-190813	BS-8	08/13/2019	REG	Soil	SW3050A	08/15/2019	SW6020A	08/21/2019	ALSHT
HS19080691	Borrow Source	BS-8-190813	BS-8	08/13/2019	REG	Soil	METHOD	08/19/2019	SW7471A	08/19/2019	ALSHT
HS19080691	Borrow Source	BS-8-190813	BS-8	08/13/2019	REG	Soil	SW5035	8/20/2019	SW8260C	08/20/2019	ALSHT
HS19080691	Borrow Source	BS-8-190813	BS-8	08/13/2019	REG	Soil	SW3541	08/14/2019	SW8270D	08/15/2019	ALSHT
HS19080691	Borrow Source	BS-8-190813	BS-8	08/13/2019	REG	Soil	METHOD	08/15/2019	SW8330A	08/19/2019	ALSHT
HS19100210	2019 Soil Confirmation	03SB29-06-07-191002	03SB29	10/02/2019	REG	Soil	SW3050A	10/07/2019	SW6020A	10/07/2019	ALSHT
HS19100210	2019 Soil Confirmation	03FL001-01-191002	03FL001-01	10/02/2019	REG	Soil	SW3050A	10/07/2019	SW6020A	10/07/2019	ALSHT
HS19100210	2019 Soil Confirmation	03FL001-01-191002-FD	03FL001-01	10/02/2019	FD	Soil	SW3050A	10/07/2019	SW6020A	10/07/2019	ALSHT
HS19100210	2019 Soil Confirmation	03WF001-01-191002	03WF001-01	10/02/2019	REG	Soil	SW3050A	10/07/2019	SW6020A	10/07/2019	ALSHT
HS19100210	2019 Soil Confirmation	03FL003-08-191002	03FL003-08	10/02/2019	REG	Soil	SW3050A	10/07/2019	SW6020A	10/07/2019	ALSHT
HS19100210	2019 Soil Confirmation	03WL001-06-07-191002	03WL001	10/02/2019	REG	Soil	SW3050A	10/07/2019	SW6020A	10/07/2019	ALSHT
HS19100210	2019 Soil Confirmation	03FL002-08-191002	03FL002-08	10/02/2019	REG	Soil	SW3050A	10/07/2019	SW6020A	10/08/2019	ALSHT

Attachment C-1: Summary of Sample Collected, Sample Date, Sample Location, and Analysis Method

SDG	Event	Sample Number	Sample Location	Sample Date	Sample Type	Matrix	Preparation Method	Preparation Date	Analytical Method	Analysis Date	Lab
HS19100210	2019 Soil Confirmation	03SP001-191002	Soil Stockpile	10/02/2019	REG	Soil	SW1311	10/08/2019	SW6020A	10/09/2019	ALSHT
HS19100210	2019 Soil Confirmation	03SP001-191002	Soil Stockpile	10/02/2019	REG	Soil	SW1311	10/09/2019	SW7470A	10/09/2019	ALSHT
HS19100915	2019 Soil Confirmation	03WL002-06-07-191012	03WL002	10/12/2019	REG	Soil	SW3050A	10/16/2019	SW6020A	10/17/2019	ALSHT
HS19101604	2019 Soil Confirmation	03WL-06-07-NW1-191024	03WL-06-07-NW1	10/24/2019	REG	Soil	SW3050A	10/28/2019	SW6020A	10/30/2019	ALSHT
HS19101604	2019 Soil Confirmation	03WL-06-07-NW1-191024-FD	03WL-06-07-NW1	10/24/2019	FD	Soil	SW3050A	10/28/2019	SW6020A	10/30/2019	ALSHT
HS19101604	2019 Soil Confirmation	03WL-06-07-EW1-191024	03WL-06-07-EW1	10/24/2019	REG	Soil	SW3050A	10/28/2019	SW6020A	10/30/2019	ALSHT
HS19101604	2019 Soil Confirmation	03WL-06-07-WW1-191024	03WL-06-07-EW1	10/24/2019	REG	Soil	SW3050A	10/28/2019	SW6020A	10/30/2019	ALSHT
HS19101604	2019 Soil Confirmation	03WL-06-07-SW1-191024	03WL-06-07-SW1	10/24/2019	REG	Soil	SW3050A	10/28/2019	SW6020A	10/30/2019	ALSHT
HS20080131	2020 Soil Confirmation	03WL-6-7-SW2-200804	03WL-6-7-SW2	08/04/2020	REG	Soil	SW3050A	08/05/2020	SW6020A	08/06/2020	ALSHT
HS20080280	2020 Stockpile	03SOILSTOCKPILE-200806	Soil Stockpile	08/06/2020	REG	Soil	TX1005PR	08/10/2020	TX1005	08/10/2020	ALSHT

Notes:

SDG - Sample Delivery Group

Reg - Regular Sample

FD - Field Duplicate

ALSHT - ALS Laboratory Houston, Texas

ALSS - ALS Laboratory Salt Lake City, Utah

Attachment C-2. Data Qualification Flags

Data Qualifier Definitions for Organic and Inorganic Data Review

Qualifier	Definition
	No Qualifier indicates that the data are acceptable both qualitatively and quantitatively.
U	The analyte was analyzed for but was not detected above the reported limit of detection.
J	The analyte was analyzed for and was positively identified, but the reported numerical value may not be consistent with the amount actually present in the environmental sample. Results are estimated, although the data are considered usable and may be used as appropriate to meet project objectives. Results are qualitatively acceptable and quantitatively uncertain.
J-	The analyte was positively identified; the associated numerical value is its approximate concentration with a low bias in the sample.
J+	The analyte was positively identified; the associated numerical value is its approximate concentration with a high bias in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a “tentative identification.”
NJ	The analysis indicates the presence of an analyte that has been ”tentatively identified,” and the associated value represents its approximate concentration.
UJ	The analyte was not detected above the reported limit of detection. However, the reported limit of detection is approximate and may or may not represent the actual limit of detection necessary to accurately and precisely measure the analyte in the sample.
X	The analyte was analyzed for, but the presence or absence of the analyte has not been verified. Re-sampling and re-analysis may be necessary to confirm or deny the presence of the analyte. Results are rejected, and data are unusable for any purposes.

Attachment C-3: Qualified Data Summary

Sample	Sample Type	Sample Date	Analyte	SDG	Result	LOQ	Units	Qualifier
Reason Code 05B		**Method SW6020A**						
BS-1-190813	REG	08/13/2019	Aluminum	HS19080691	21000	408	mg/kg	J+
BS-2-190813	REG	08/13/2019	Aluminum	HS19080691	17900	418	mg/kg	J+
BS-3-190813	REG	08/13/2019	Aluminum	HS19080691	5610	201	mg/kg	J+
BS-4-190813	REG	08/13/2019	Aluminum	HS19080691	11400	428	mg/kg	J+
BS-5-190813	REG	08/13/2019	Aluminum	HS19080691	11500	437	mg/kg	J+
BS-6-190813	REG	08/13/2019	Aluminum	HS19080691	24700	439	mg/kg	J+
BS-7-190813	REG	08/13/2019	Aluminum	HS19080691	16300	417	mg/kg	J+
BS-8-190813	REG	08/13/2019	Aluminum	HS19080691	10300	196	mg/kg	J+
Reason Code 06		**Method SW8290A**						
BS-1-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	1.52	2.6	ng/kg	U
BS-1-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	0.216	2.6	ng/kg	U
BS-1-190813	REG	08/13/2019	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	E1900593	0.438	2.6	ng/kg	U
BS-1-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	E1900593	0.605	2.6	ng/kg	U
BS-1-190813	REG	08/13/2019	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	E1900593	0.517	2.6	ng/kg	U
BS-1-190813	REG	08/13/2019	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	E1900593	0.315	2.6	ng/kg	U
BS-1-190813	REG	08/13/2019	Heptachlorodibenzofuran	E1900593	7.38	3.12	ng/kg	U
BS-1-190813	REG	08/13/2019	Hexachlorinated Dibenzofurans, (Total)	E1900593	0.421	6.25	ng/kg	U
BS-1-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	9.72	5.21	ng/kg	U
BS-1-190813	REG	08/13/2019	Pentachlorinated Dibenzo-P-Dioxins, (Total)	E1900593	0.315	2.6	ng/kg	U
BS-2-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	1.78	2.7	ng/kg	U
BS-2-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	0.622	2.7	ng/kg	U
BS-2-190813	REG	08/13/2019	1,2,3,4,7,8-Hexachlorodibenzofuran	E1900593	0.431	2.7	ng/kg	U
BS-2-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	E1900593	1.27	2.7	ng/kg	U

Attachment C-3: Qualified Data Summary

Sample	Sample Type	Sample Date	Analyte	SDG	Result	LOQ	Units	Qualifier
BS-2-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzofuran	E1900593	0.357	2.7	ng/kg	U
BS-2-190813	REG	08/13/2019	2,3,4,6,7,8-Hexachlorodibenzofuran	E1900593	0.58	2.7	ng/kg	U
BS-2-190813	REG	08/13/2019	2,3,4,7,8-Pentachlorodibenzofuran	E1900593	0.334	2.7	ng/kg	U
BS-2-190813	REG	08/13/2019	Heptachlorodibenzofuran	E1900593	6.98	3.24	ng/kg	U
BS-2-190813	REG	08/13/2019	Hexachlorinated Dibenzofurans, (Total)	E1900593	0.677	6.48	ng/kg	U
BS-2-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	10.3	5.4	ng/kg	U
BS-2-190813	REG	08/13/2019	Pentachlorinated Dibenzofurans, (Total)	E1900593	0.334	3.24	ng/kg	U
BS-3-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin	E1900593	8.4	2.5	ng/kg	U
BS-3-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	2.19	2.5	ng/kg	U
BS-3-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	0.399	2.5	ng/kg	U
BS-3-190813	REG	08/13/2019	1,2,3,4,7,8-Hexachlorodibenzofuran	E1900593	0.34	2.5	ng/kg	U
BS-3-190813	REG	08/13/2019	Heptachlorodibenzo-P-Dioxin	E1900593	8.4	2.5	ng/kg	U
BS-3-190813	REG	08/13/2019	Heptachlorodibenzofuran	E1900593	0.399	3	ng/kg	U
BS-3-190813	REG	08/13/2019	Hexachlorinated Dibenzofurans, (Total)	E1900593	0.466	6.01	ng/kg	U
BS-3-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	50.6	5.01	ng/kg	U
BS-4-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	9.57	2.76	ng/kg	U
BS-4-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	1.81	2.76	ng/kg	U
BS-4-190813	REG	08/13/2019	1,2,3,4,7,8-Hexachlorodibenzofuran	E1900593	1.67	2.76	ng/kg	U
BS-4-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzofuran	E1900593	0.812	2.76	ng/kg	U
BS-4-190813	REG	08/13/2019	1,2,3,7,8,9-Hexachlorodibenzofuran	E1900593	0.457	2.76	ng/kg	U

Attachment C-3: Qualified Data Summary

Sample	Sample Type	Sample Date	Analyte	SDG	Result	LOQ	Units	Qualifier
BS-4-190813	REG	08/13/2019	1,2,3,7,8-Pentachlorodibenzofuran	E1900593	0.401	2.76	ng/kg	U
BS-4-190813	REG	08/13/2019	2,3,4,6,7,8-Hexachlorodibenzofuran	E1900593	0.501	2.76	ng/kg	U
BS-4-190813	REG	08/13/2019	2,3,4,7,8-Pentachlorodibenzofuran	E1900593	0.258	2.76	ng/kg	U
BS-4-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	143	5.52	ng/kg	U
BS-4-190813	REG	08/13/2019	Pentachlorinated Dibenzofurans, (Total)	E1900593	0.401	3.31	ng/kg	U
BS-5-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	0.974	2.77	ng/kg	U
BS-5-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	0.126	2.77	ng/kg	U
BS-5-190813	REG	08/13/2019	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	E1900593	0.355	2.77	ng/kg	U
BS-5-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	E1900593	0.345	2.77	ng/kg	U
BS-5-190813	REG	08/13/2019	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	E1900593	0.512	2.77	ng/kg	U
BS-5-190813	REG	08/13/2019	Heptachlorodibenzofuran	E1900593	4.23	3.32	ng/kg	U
BS-5-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	5.76	5.54	ng/kg	U
BS-6-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	0.636	2.8	ng/kg	U
BS-6-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	0.225	2.8	ng/kg	U
BS-6-190813	REG	08/13/2019	Heptachlorodibenzofuran	E1900593	1.82	3.36	ng/kg	U
BS-6-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	2.71	5.59	ng/kg	U
BS-7-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	3.47	2.74	ng/kg	U
BS-7-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	0.453	2.74	ng/kg	U
BS-7-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzofuran	E1900593	0.475	2.74	ng/kg	U
BS-7-190813	REG	08/13/2019	Heptachlorodibenzofuran	E1900593	15.6	3.29	ng/kg	U
BS-7-190813	REG	08/13/2019	Hexachlorinated Dibenzofurans, (Total)	E1900593	2.17	6.58	ng/kg	U

Attachment C-3: Qualified Data Summary

Sample	Sample Type	Sample Date	Analyte	SDG	Result	LOQ	Units	Qualifier
BS-7-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	23.7	5.48	ng/kg	U
BS-8-190813	REG	08/13/2019	1,2,3,4,6,7,8-Heptachlorodibenzofuran	E1900593	1.72	2.46	ng/kg	U
BS-8-190813	REG	08/13/2019	1,2,3,4,7,8,9-Heptachlorodibenzofuran	E1900593	0.27	2.46	ng/kg	U
BS-8-190813	REG	08/13/2019	1,2,3,4,7,8-Hexachlorodibenzofuran	E1900593	0.194	2.46	ng/kg	U
BS-8-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	E1900593	0.812	2.46	ng/kg	U
BS-8-190813	REG	08/13/2019	1,2,3,6,7,8-Hexachlorodibenzofuran	E1900593	0.159	2.46	ng/kg	U
BS-8-190813	REG	08/13/2019	1,2,3,7,8,9-Hexachlorodibenzofuran	E1900593	0.174	2.46	ng/kg	U
BS-8-190813	REG	08/13/2019	2,3,4,6,7,8-Hexachlorodibenzofuran	E1900593	0.222	2.46	ng/kg	U
BS-8-190813	REG	08/13/2019	Heptachlorodibenzofuran	E1900593	6.4	3	ng/kg	U
BS-8-190813	REG	08/13/2019	Hexachlorinated Dibenzo-P-Dioxins, (Total)	E1900593	0.812	4.5	ng/kg	U
BS-8-190813	REG	08/13/2019	Hexachlorinated Dibenzofurans, (Total)	E1900593	0.222	6	ng/kg	U
BS-8-190813	REG	08/13/2019	Octachlorodibenzofuran	E1900593	7.61	4.91	ng/kg	U
BS-8-190813	REG	08/13/2019	Pentachlorinated Dibenzofurans, (Total)	E1900593	0.246	3	ng/kg	U
Reason Code 08A		**Method SW6020A**						
03SB21-0.0-2.0	REG	11/29/2018	Lead	HS18120004	10.2	0.458	mg/kg	J+
BS-1-190813	REG	08/13/2019	Arsenic	HS19080691	17.4	2.55	mg/kg	J-
BS-1-190813	REG	08/13/2019	Barium	HS19080691	17.2	0.511	mg/kg	J+
BS-1-190813	REG	08/13/2019	Chromium	HS19080691	33	2.55	mg/kg	J-
BS-1-190813	REG	08/13/2019	Manganese	HS19080691	11.1	2.55	mg/kg	J-
BS-1-190813	REG	08/13/2019	Potassium	HS19080691	535	51.1	mg/kg	J-
BS-1-190813	REG	08/13/2019	Selenium	HS19080691	0.734	0.511	mg/kg	J-
03FL002-08-191002	REG	10/02/2019	Lead	HS19100210	8.04	0.526	mg/kg	J-
03WL002-06-07-191012	REG	10/12/2019	Lead	HS19100915	12.3	1.05	mg/kg	J+
03WL-06-07-NW1-191024	REG	10/24/2019	Arsenic	HS19101604	5.1	0.523	mg/kg	J-
03WL-06-07-NW1-191024	REG	10/24/2019	Lead	HS19101604	20.5	0.523	mg/kg	J-

Attachment C-3: Qualified Data Summary

Sample	Sample Type	Sample Date	Analyte	SDG	Result	LOQ	Units	Qualifier
Reason Code 08A, 08B		**Method SW6020A**						
BS-1-190813	REG	08/13/2019	Zinc	HS19080691	11.8	2.55	mg/kg	J+
03WL002-06-07-191012	REG	10/12/2019	Arsenic	HS19100915	7.84	1.05	mg/kg	J+
Reason Code 08A, 15		**Method SW6020A**						
BS-1-190813	REG	08/13/2019	Antimony	HS19080691	0.237	0.511	mg/kg	J-
BS-1-190813	REG	08/13/2019	Calcium	HS19080691	34.8	51.1	mg/kg	J-

Note:

Please see Attachment C-2 for definitions of qualifiers

mg/kg: milligrams per kilogram

ng/kg: nanograms per kilogram

LOQ: limit of quantitation

REG: regular sample

SDG: sample delivery group

Attachment C-4: Summary of Field Duplicate Results

		Location Code	03FL001-01					03SB20				
		Sample Number	03FL001-01-191002		03FL001-01-191002-FD			03SB20-0.0-2.0		03SB20-0.0-2.0-FD		
		Sample Date	10/02/2019		10/02/2019		**Relative Percent Difference**	11/29/2018		11/29/2018		**Relative Percent Difference**
		Sample Purpose	REG		FD			REG		FD		
		Sample Type	Soil		Soil			Soil		Soil		
		Depth	1 - 1 ft		1 - 1 ft			0 - 2 ft		0 - 2 ft		
Test Group	**Parameter**	**Units**	**Result**	**VQ**	**Result**	**VQ**		**Result**	**VQ**	**Result**	**VQ**	
METALS	Arsenic	mg/kg	2.34		1.91		20.24	1.54		4.05		89.80
	Lead	mg/kg	13.4		13.6		1.48	8.26		11.3		31.08

Notes:

Please see Attachment C-2 for definitions of qualifiers

mg/kg: milligrams per kilograms

REG: regular samples shipped to the laboratory

FD: field duplicate samples shipped to the laboratory

VQ: validation qualifier

Attachment C-4: Summary of Field Duplicate Results

		Location Code	03SB22					03SB26				
		Sample Number	03SB22-3.0-4.0		03SB22-3.0-4.0-FD			03SB26-0.0-2.0		03SB26-0.0-2.0-FD		
		Sample Date	11/29/2018		11/29/2018		Relative Percent Difference	11/29/2018		11/29/2018		Relative Percent Difference
		Sample Purpose	REG		FD			REG		FD		
		Sample Type	Soil		Soil			Soil		Soil		
		Depth	3 - 4 ft		3 - 4 ft			0 - 2 ft		0 - 2 ft		
Test Group	**Parameter**	**Units**	**Result**	**VQ**	**Result**	**VQ**		**Result**	**VQ**	**Result**	**VQ**	
METALS	Arsenic	mg/kg	4.61		0.709		146.68	5.83		1.92		100.90
	Lead	mg/kg	8.66		6.26		32.17	8.6		8.38		2.59

Notes:

Please see Attachment C-2 for definitions of qualifiers

mg/kg: milligrams per kilograms

REG: regular samples shipped to the laboratory

FD: field duplicate samples shipped to the laboratory

VQ: validation qualifier

Attachment C-4: Summary of Field Duplicate Results

		Location Code	03WL-06-07-NW1				
		Sample Number	03WL-06-07-NW1-191024		03WL-06-07-NW1-191024-FD		**Relative Percent Difference**
		Sample Date	10/24/2019		10/24/2019		
		Sample Purpose	REG		FD		
		Sample Type	Soil		Soil		
		Depth	0 - 0 ft		0 - 0 ft		
Test Group	**Parameter**	**Units**	**Result**	**VQ**	**Result**	**VQ**	
METALS	Arsenic	mg/kg	5.1	J	2.62		64.25
	Lead	mg/kg	20.5	J	18.9		8.12

Notes:

Please see Attachment C-2 for definitions of qualifiers

mg/kg: milligrams per kilograms

REG: regular samples shipped to the laboratory

FD: field duplicate samples shipped to the laboratory

VQ: validation qualifier

Attachment C-5: Technical Completeness

Analytical Method	Number of Analytes	Number of Samples	Number of Results	Number of Rejected Results	of Useable Results	Completeness [Goal = 95 %] (percent)
SW6020A	22	51	271 *	0	271	100
SW6850	1	8	8	0	8	100
SW7470A	1	1	1	0	1	100
SW7471A	1	8	8	0	8	100
SW8260C	50	8	400	0	400	100
SW8270D	65	8	520	0	520	100
SW8290A	26	8	208	0	208	100
SW8330A	13	8	104	0	104	100
TX1005	4	1	4	0	4	100

Notes

* not all samples were analyzed for the same list of metals.

Appendix D

Backfill Soil Load Tickets

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

343654

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	14		
ORIGIN	**DESTINATION**	**COMMODITY**		**TOTAL**
M	1160986 - DOO DP	Clean fill		

DRIVER'S NAME

REMARKS EAST TEXAS SEPTIC

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

343653

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	14		
ORIGIN	**DESTINATION**	**COMMODITY**		**TOTAL**
M	1160986 DDO DP	Clean fill		

DRIVER'S NAME

REMARKS Chambers Tkt #1

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

343651

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptm	14		
ORIGIN	**DESTINATION**	**COMMODITY**		**TOTAL**
M	11609 86 DD DP	Clean fill		

DRIVER'S NAME

REMARKS EAST TEXAS SEPT/C

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

324800

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	44		
ORIGIN	**DESTINATION**	**COMMODITY**		**TOTAL**
M	11609866- DDO Dr	clean fill		

DRIVER'S NAME

REMARKS Dark Peat Trucking

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

343652

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	14		
ORIGIN	**DESTINATION**	**COMMODITY**		**TOTAL**
M	Tyler 196 DD DP	Clean Fill		

DRIVER'S NAME

REMARKS BARR 4 P TRUCKING

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

324799

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	14		

ORIGIN	DESTINATION	COMMODITY	TOTAL
M	11600986-000 OP	clean fill	

DRIVER'S NAME

REMARKS EAST TEXAS SEPT. C

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

324798

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	14		

ORIGIN	DESTINATION	COMMODITY	TOTAL
M	116 DaBo-000 OP	clean fill	

ME Chambers Tch#1

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

324795

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	14		

ORIGIN	DESTINATION	COMMODITY	TOTAL
m	1160986-000 DP	clean fill	

DRIVER'S NAME

REMARKS Chambers T-K#1

NASH TRUCKING & CONSTRUCTION, LTD

PO Box 219
Woodlawn, Texas 75694
(903) 938-5426
Fax (903) 935-6036

324793

DATE 8-10-20

SHIPPER	CONSIGNEE	YARDS	TONS	MILES
NASH	Aptim	14		

ORIGIN	DESTINATION	COMMODITY	TOTAL
M	1160986-DOO DP	clean fill	

DRIVER'S NAME

REMARKS EAST TEXAS SEPTIC

Appendix E

Waste Disposal Manifests

WASTE CONNECTIONS

No. 23938

NON - HAZARDOUS MANIFEST 63146 16:26

GENERATOR

Generator: US Army Longhorn Ammunition
Address: 15600 FM 134
Karnack, Tx 75661
Phone: (479) 635-0110

EPA I.D.#:
Shipping Location(s): Same as generator
Address:
Phone:

Description of Waste Materials	State Regulated Waste Code(s)	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Contaminated Soil		34A77989	~~50~~ 21.94	TONS	

I hereby certify that the above described materials are not hazardous wastes as defined by 40 CFR, Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable law and regulations.

Rose M. Zeiler — Generator Authorized Agent Name (Print)

Rose M. Zeiler — Generator Signature

9-28-20 — Delivery Date

TRANSPORTER

Transporter Name: Dodson Trucking
1854 CR 2215
Address: Talty Tx 75091

I hereby acknowledge receipt of the above-described materials for transport from the generator shipping location listed above.

x Tim Huntsman — Driver Signature

09/30/20 — Shipment Date

Driver Name (Print): Tim Huntsman
Truck Number: 37
Truck Type: Dump

I hereby acknowledge receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below.

x Tim Huntsman — Driver Signature

09/30/20 — Shipment Date

DESTINATION

Entity Name: IESI TX Landfill LP
Site Location: Henderson
Address: 5155 FM 2867
Henderson, TX 75654

Facility Type: TYPE 1 LANDFILL
State Permit #: MSW - 1249B
Phone Number: (903) 889-2872

Disposal Location: North ____ East ____ Level ____

I hereby acknowledge receipt of the above described materials.

Bonnie Rutledge — Name of Authorized Agent (Print)

Signature

9-30-20 — Receipt Date

White - Original — Canary - Disposer Retain — Pink - Transporter Retain — Goldenrod - Generator Retain

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WASTE CONNECTIONS

No. 23936

NON - HAZARDOUS MANIFEST

6338 15:00

GENERATOR

Generator US Army Longhorn Ammunition

Address 15600 FM 134

Karnack, Tx 75661

Phone (479) 635-0110

EPA I.D.#

Shipping Location(s) Same as generator

Address

Phone

Description of Waste Materials	State Waste Code #	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Contaminated Soil		34A-79139	~~27~~ 25.90	tons	

I hereby certify that the above described materials are not hazardous wastes as defined by 40 CFR Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable law and regulations.

Rose M. Zeiler
Generator Authorized Agent Name (Print)

Rose M. Zeiler 9-28-20
Generator Signature Delivery Date

TRANSPORTER

Transporter Name Dodson Trucking

18543 CC 22130

Address Tatum, Tx 75691

I hereby acknowledge receipt of the above described materials for transport from the generator shipping location listed above.

Donald Daley 09/30/20
Driver Signature Shipment Date

Driver Name (Print) Donald Daley

Truck Number 57

Truck Type End Dump

I hereby acknowledge receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below.

Donald Daley 09/30/20
Driver Signature Shipment Date

DESTINATION

Entity Name IESI TX Landfill LP

Site Location Henderson

Address 5155 FM 2867

Henderson, TX 75654

Facility Type TYPE 1 LANDFILL

State Permit # MSW - 1249B

Phone Number (903) 889-2872

Disposal Location: North East Level

I hereby acknowledge receipt of the above described materials

Bonnie Rutledge
Name of Authorized Agent (Print)

9-30-20
Signature Receipt Date

White - Original Canary - Disposer Retain Pink - Transporter Retain Goldenrod - Generator Retain

WASTE CONNECTIONS

No. 23937

NON - HAZARDOUS MANIFEST 63137 14:58

GENERATOR

Generator US Army Longhorn Ammunition — EPA

Address 5600 FM 134 — I.D.#

Karnack, TX 75661 — Shipping Location(s) same as generator

Address

Phone 479-635-0110 — Phone

Description of Waste Materials	State Industrial Waste Code #	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Contaminated Soil		34A77TB9	25.98	ton	

I hereby certify that the above describe materials are not hazardous wastes as defined by 40 CFR Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable law or regulations.

Rose M. Zuber — Rose M. Zuber — 9-28-20

Generator Authorized Agent Name (Print) — Generator Signature — Delivery Date

TRANSPORTER

Transporter Name Dodson Trucking

18543 CR 2213 D

Address Tatum, Tx 75691

I hereby acknowledge receipt of the above-described materials for transport from the generator shipping location listed above.

09/30/20

Driver Signature — Shipment Date

Driver Name (Print) Ray Collins

Truck Number 54

Truck Type Tri Dump

I hereby acknowledge receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below.

Driver Signature — 09/30/20 Shipment Date

DESTINATION

Entity Name IESI TX Landfill LP — Facility Type TYPE 1 LANDFILL

Site Location Henderson — State Permit # MSW - 1249B

Address 5155 FM 2867

Henderson, TX 75654 — Phone Number (903) 889-2872

Disposal Location: North — East — Level

I hereby acknowledge receipt of the above-described materials.

Bonnie Rutledge — 9-30-20

Name of Authorized Agent (Print) — Signature — Receipt Date

White - Original — Canary - Disposal Retain — Pink - Transporter Retain — Goldenrod - Generator Retain

WASTE CONNECTIONS
Change with the Future

No. 23935

NON - HAZARDOUS MANIFEST

63120 12:45

GENERATOR

Generator US Army Longhorn Ammunition Plant — EPA

Address 15600 FM 934 — I.D.#

Karnack, TX 75661 — Shipping Location(s) same as generator

Phone 479-635-0110 — Address

Phone

Description of Waste Materials	State Haz. Inst. Waste Class #	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Contaminated Soil		34AF79159	20.76	ton	

I hereby certify that the above described materials are not hazardous wastes as defined by 40 CFR, Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable laws and regulations.

Rose M. Zeiler — Generator Authorized Agent Name (Print)

Rose M Zeiler — Generator Signature

9-28-20 — Delivery Date

TRANSPORTER

Transporter Name Dodson Trucking

18543 CR 22130

Address Tyler, TX 75691

I hereby acknowledge receipt of the above-described materials for transport from the generator shipping location listed above.

TIM HUNTSMAN — Driver Signature

09/30/20 — Shipment Date

Driver Name (Print) TIM Huntsman

Truck Number 35

Truck Type Demolition

I hereby acknowledge receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below.

Tim Hunter — Driver Signature

09/30/20 — Shipment Date

DESTINATION

Entity Name IESI TX Landfill LP — Facility Type TYPE 1 LANDFILL

Site Location Henderson — State Permit # MSW - 1249B

Address 5155 FM 2867 — Phone Number (903) 889-2872

Henderson, TX 75654

Disposal Location: North ____ East ____ Level ____

I hereby acknowledge receipt of the above-described materials.

Bonnie Rutledge — Name of Authorized Agent (Print)

Signature

9-30-20 — Receipt Date

White - Original — Canary - Disposer Retain — Pink - Transporter Retain — Goldenrod - Generator Retain

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WASTE CONNECTIONS

No. 23934

NON - HAZARDOUS MANIFEST

63094 10:16

GENERATOR

Generator US Army Longhorn Ammunition

Address 15600 FM 134

Karnack, Tx 75661

Phone (479) 635-0110

EPA I.D.#

Shipping Location(s) Same as generator

Address

Phone

Description of Waste Materials	State Industrial Waste Code #	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Contaminated Soil		34A779139	~~20~~ 26.15	TONS	

I hereby certify that the above described materials are not hazardous wastes as defined by 40 CFR, Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable law and regulations.

Rose M. Zeiler — Generator Authorized Agent Name (Print)

Rose M. Zeiler — Generator Signature

9-30-20 — Delivery Date

TRANSPORTER

Transporter Name Dodson Trucking

Address Tatum

I hereby acknowledge receipt of the above-described materials for transport from the generator shipping location listed above.

Donald Daly — Driver Signature

09/30/20 — Shipment Date

Driver Name (Print) Donald Daley

Truck Number 57

Truck Type End Dump

I hereby acknowledge receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below.

Donald Daly — Driver Signature

09/30/20 — Shipment Date

DESTINATION

Entity Name IESI TX Landfill LP

Site Location Henderson

Address 5155 FM 2867

Henderson, TX 75654

Facility Type TYPE 1 LANDFILL

State Permit # MSW - 1249B

Phone Number (903) 889-2872

Disposal Location: North East Level

I hereby acknowledge receipt of the above-described materials.

Bonnie Rutledge — Name of Authorized Agent (Print)

Signature

9-30-20 — Receipt Date

White - Original | Canary - Disposer Retain | Pink - Transporter Retain | Goldenrod - Generator Retain

Geo. 713 243 7095

Bill Foss

No. 23933

NON - HAZARDOUS MANIFEST

63089 9:55 APT/M - Houston, OFFICE

WASTE CONNECTIONS

GENERATOR

Generator US Army Longhorn Ammunition EPA

Address 15600 FM 134 I.D.#

Kennack, TX 75661 Shipping Location(s) same as generator

Address

Phone 469-635-0110 Phone

Description of Waste/Materials	State Regulated Waste Code #	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Contaminated Soil		34A779B9	~~20~~ 24.11	ton	

I hereby certify that the above-described materials are not hazardous wastes as defined by 40 CFR, Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable law and regulations.

Rose M. Zeiler — Generator Authorized Agent Name (Print)

Rose M. Zeiler 9-28-20 — Generator Signature / Delivery Date

TRANSPORTER

Transporter Name Dodson Trucking Driver Name (Print) Ray Collins

18543 CR 2214 Truck Number 52

Address Athens, TX Truck Type End Dump

I hereby acknowledge receipt of the above-described materials for transport from the generator shipping location listed above.

I hereby acknowledge the receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below.

Driver Signature 09/30/20 Shipment Date — Driver Signature 09/30/2 Shipment Date

DESTINATION

Entity Name IESI TX Landfill LP Facility Type TYPE 1 LANDFILL

Site Location Henderson State Permit # MSW - 1249B

Address 5156 FM 2867 Phone Number (903) 889-2872

Henderson, TX 75654

Disposal Location: North East Level

I hereby acknowledge receipt of the above-described materials.

Bonnie Rutledge — Name of Authorized Agent (Print)

Signature 9-30-2 Receipt Date

White - Original | Canary - Disposer Retain | Pink - Transporter Retain | Goldenrod - Generator Retain

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WASTE CONNECTIONS

No. 23932

NON - HAZARDOUS MANIFEST 63085 9:29

GENERATOR

Generator: US Army Longhorn Ammunition

Address: 15600 FM 134
Karnack, Tx 75661

Phone: (479) 635-0110

EPA I.D.#:

Shipping Location(s): Same as generator

Address:

Phone:

Description of Waste Materials	State-Industrial Waste Code #	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Contaminated Soil		34A779B9	~~20~~ 17.16	Tons	

I hereby certify that the above described material is not hazardous wastes as defined by 40 CFR, Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable law and regulations.

Rose M. Zeiler
Generator Authorized Agent Name (Print)

Rose M. Zeiler 9-28-20
Generator Signature / Delivery Date

TRANSPORTER

Transporter Name: Dodson Trucking
18543 CR 2213D
Address: Tatum Tx 75691

Driver Name (Print): Tim Huntsman

Truck Number: 38

Truck Type: Demolition

I hereby acknowledge receipt of the above-described materials for transport from the generator shipping location listed above.

Tim M. Huntsman 09/30/20
Driver Signature / Shipment Date

I hereby acknowledge receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below.

Tim Huntsman 09/30/20
Driver Signature / Shipment Date

DESTINATION

Entity Name: IESI TX Landfill LP

Site Location: Henderson

Address: 5455 FM 2867
Henderson, TX 75654

Facility Type: TYPE 1 LANDFILL

State Permit #: MSW - 1249B

Phone Number: (903) 889-2872

Disposal Location: North East Level

I hereby acknowledge receipt of the above-described materials.

Bonnie Rutledge
Name of Authorized Agent (Print)

Signature

9:30-20
Receipt Date

White - Original / Canary - Disposer Retain / Pink - Transporter Retain / Goldenrod - Generator Retain

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WASTE CONNECTIONS
Connect with the Future

2193 No. 23106

NON - HAZARDOUS MANIFEST

~~08/18~~ 11:54

GENERATOR

Generator US Army Longhorn Ammunition Plant EPA

Address 15600 FM 134 I.D.#

Karnack, TX 75661 Shipping Location(s)

Address

Phone (903) 635-0110 Phone

Description of Waste Materials	State Industrial Waste Code #	WC Profile Number	Total Quantity	Unit of Measure	Container Type
Water		FCC7B9CF	3.91	tons	tank

I hereby certify that the above describe material are not hazardous wastes as defined by 40 CFR, Part 261 or any applicable state law or regulation, have been fully and accurately described, classified and packaged, and are in proper condition for transportation according to applicable law and regulations.

Rose M. Zeiler — Rose M. Zeiler — 01-29-21

Generator Authorized Agent Name (Print) — Generator Signature — Delivery Date

TRANSPORTER

Transporter Name Ivron Services

Address 6202 SH 42W Kilgore TX 75662

I hereby acknowledge receipt of the above-described materials for transport from the generator shipping location listed above.

James Kinder — 01-29-21

Driver Signature — Shipment Date

Driver Name (Print) James Kinder

Truck Number 10226

Truck Type 60BBL Vac Truck

I hereby acknowledge receipt of the above-described materials were received from the generator shipping location and were transported without incident to the destination listed below. 938 Gal

James Kinder — 01-29-21

Driver Signature — Shipment Date

DESTINATION

Entity Name IESI TX Landfill LP Facility Type TYPE 1 LANDFILL

Site Location Henderson

Address 5155 FM 2867 State Permit # MSW - 1249B

Henderson, TX 75654 Phone Number (903) 889-2872

Disposal Location: North East Level

I hereby acknowledge receipt of the above-described materials.

Name of Authorized Agent (Print) — Signature — 1-29-21 Receipt Date

White - Original — Canary - Disposer Retain — Pink - Transporter Retain — Goldenrod - Generator Retain