Subject: Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting
Longhorn Army Ammunition Plant (LHAAP)
Location of Meeting: Conference Call
Date of Meeting: January 21, 2021, 6:00 PM Central Standard Time (CST)

Meeting Participants:

Army BRAC:	Rose M. Zeiler
USACE:	Aaron Williams
USAEC:	Andrew Maly, Laura Zographos, and Thomas Toudouze
Bhate:	Kim Nemmers
APTIM:	Bill Foss
HDR, Inc.	Philip Werner
TLI:	Kyra Donnell
USEPA Region 6:	Lauren Poulos and Kent Becher-USGS Liaison
TCEQ:	April Palmie
RAB:	Present: Deon Hall, Richard LeTourneau, and Donna Burney Absent: Judy VanDeventer; John Fortune; Terry Britt; John Pollard, Jr.; Tom Walker; Charles Dixon; and Nigel R. Shivers
Public:	Laura-Ashley Overdyke (Executive Director of the Caddo Lake Institute [CLI]); George Rice (CLI)

An agenda for the RAB meeting, a color copy of the Bhate Environmental Associates, Inc. (Bhate) slide presentation, and handouts (see list at end of meeting minutes) were provided for meeting attendees via electronic mail (e-mail) and regular postal mail for hard copies.

Welcome and Introduction

Ms. Judy VanDeventer and Ms. Rose Zeiler, the RAB Co-Chairs, were not present at the start of the meeting, therefore, Ms. Kim Nemmers called the meeting to order. Ms. Nemmers pointed out the map within the slides that present the different sites that are discussed during the RAB meeting. Ms. Nemmers said that the agenda for the RAB meeting was previously provided and has not changed.

RAB Meeting Format and Presentation

Mr. Aaron Williams said that Army is always looking for new members. Mr. Williams said that if anyone knows of someone interested in joining the RAB that the person can reach out to Ms. VanDeventer or Ms. Zeiler. Mr. Williams said that the RAB meeting minutes from the October 2020 meeting were sent out and should have been received. Mr. Richard LeTourneau made a motion to approve the minutes to which Mr. Deon Hall seconded.

COVID-19 Status Update

Ms. Nemmers stated that the requirement to follow Executive Order (EO) and Proclamation issued by the Texas governor on July 2, 2020, has been lifted on a county by county basis. At the time of planning for the meeting, Harrison County was still required to follow the EO which is why the RAB meeting was being held remotely. Ms. Nemmers said the hope is to meet face-to-

face in April 2021 for the 2nd quarter meeting. Ms. Nemmers said that the decision on how to hold the meeting is made about 45 days ahead of the meeting. Ms. Zeiler joined the call during the COVID-19 discussion.

Defense Environmental Restoration

Overview of Sites

Ms. Nemmers discussed the documents currently in progress. Ms. Nemmers explained that Remedial Action Completion Reports (RACRs) are in progress for LHAAP-03, -04, and -16. Ms. Nemmers said that the RACRs document the remedies put in place. Ms. Nemmers said that Remedial Action Operation (RA-O) Reports are in progress for LHAAP-46 and -50 and the Fourth Quarter 2020 Groundwater Treatment Plant (GWTP) Report.

Ms. Nemmers discussed field work completed since the RAB meeting in October 2020. Ms. Nemmers said that the field work since the last meeting was all groundwater sampling to evaluate performance of the remedies. Ms. Nemmers explained that the surface water samples from the bayous were collected in December 2020 and the data is presented in the handouts included with the RAB slides.

LHAAP-04

Mr. Bill Foss explained that the first figure on Slide 10 presents the original perchlorate plume at LHAAP-04 from January 2019 before the remedy was implemented. Mr. Foss pointed out that the purple points are the injection points. Mr. Foss pointed out the four monitoring wells within the original perchlorate plume and the one monitoring well downgradient of the plume. Mr. Foss then presented the groundwater results from prior to the remedy and then the quarterly results following the injections. Mr. Foss pointed out that perchlorate was detected in February 2020 following the injections but the May, August, and December 2020 sampling results were below the cleanup level. Mr. Foss explained that the dissolved oxygen was below 1 milligram per liter (mg/L) and the oxidation-reduction potential remained negative, which indicated reducing conditions, which means that continued treatment will occur if there is residual perchlorate present. Mr. Foss said that the groundwater sampling will continue quarterly for another year with the next sampling event in February 2021. Mr. Foss said that a Land Use Control (LUC), which is part of the remedy for prohibition of excavation and groundwater use, will be filed with the County. Surveyors were onsite to survey the LUC boundary. Ms. Laura-Ashley Overdyke asked about the January 2019 results that were elevated. Mr. Foss explained that the January 2019 results were prior to the remedy implementation. Injections were completed in November 2019. Mr. George Rice said that the results are impressive so far.

LHAAP-16

Mr. Foss explained that LHAAP-16 is another site where an injection remedy was performed and a LUC is a component of the remedy. Mr. Foss said that the LUC boundary for LHAAP-16 was also surveyed and will be filed with the county. Mr. Foss said that the red line on the figure on slide 13 shows the groundwater and land use boundary. Mr. Foss explained that the red line borders the LUC boundary for LHAAP-18/24 and LHAAP-17. Mr. Foss said that the blue line is the boundary of the landfill cover restriction. Mr. Foss said that the LUC is for groundwater use except

for environmental sampling and remediation and restricting land use to nonresidential.

Look Ahead

Ms. Nemmers then discussed the 3-month look ahead for LHAAP field work. Ms. Nemmers said that more monitoring of the remedies will be completed.

Ms. Nemmers discussed the document look-ahead. Ms. Nemmers said that once the LUC boundaries are filed with the county that the RACRs for LHAAP-04 and -16 will be issued as final and include the filings with the county. She said that the LHAAP-03 RACR will also be finalized in the coming months. Ms. Nemmers explained that the Excavation and Backfilling Report for LHAAP-17 is the final report from the Bhate contract that summarizes the work completed and is the handoff of the site to MMG-TLI Joint Venture. Ms. Nemmers explained that the other reports planned for the next 3 months include a summary of groundwater sampling at LHAAP-46 and the Fourth Quarter 2020 GWTP Report that also includes the groundwater sampling from LHAAP-18/24 where the groundwater treated by the GWTP is extracted.

Groundwater Treatment Plant

Ms. Nemmers explained the graph that shows the treated groundwater discharged. Ms. Nemmers stated that lower discharge amounts are shown in October and November 2020 due to limited precipitation. Ms. Nemmers said that the rain that came in December allowed for discharge to the Bayou. She explained that the volume of water discharged in December 2020 included both water from the GWTP and the holding pond where water that is treated by the GWTP is stored when it is not released to the Bayou.

Surface Water Sampling

Ms. Nemmers said that the surface water sampling results from 2020 had all been near or at non-detect. Ms. Nemmers said that the information presented about the GWTP and surface water was included in handouts that were e-mailed and mailed out.

LHAAP-18/24, LHAAP-29, and LHAAP-47

Mr. Philip Werner said HDR is working on LHAAP-18/24, -29, and -47. Mr. Werner explained that the draft Pre-Design Investigation (PDI) Work Plan for LHAAP-18/24 will be submitted to the Regulators next week. Mr. Werner said that the draft final LHAAP-29 PDI Work Plan is in final review by the Regulators. Mr. Werner explained that the LHAAP-47 Draft Final Post Screening Investigation (PSI) Addendum No. 2 Report is in final review by the Regulators. He said that the Draft Feasibility Study Addendum for LHAAP-47 was submitted that day to the Regulators. Mr. Werner said that the LHAAP-47 Draft Revised Proposed Plan was in progress for a March 2021 submittal.

Mr. Werner explained that PDI field activities at LHAAP-18/24 and LHAAP-29 will be done concurrently with LHAAP-18/24 direct push technology (DPT) drilling to install monitoring wells followed by DPT soil sampling at LHAAP-29. Ms. Zeiler explained that the additional field work was being completed to gather additional data before preparing the design.

For LHAAP-47, additional monitoring wells, DPT borings, and samples from soil and groundwater were presented in the PSI Addendum Report that is currently under review. Mr. Werner explained that remedies and technologies are being evaluated for LHAAP-47 under the Feasibility Study phase. A Proposed Plan will then be prepared.

Mr. Werner said slide 22 is a summary of the field work completed in 2020 at LHAAP-47. Mr. Werner said that the original investigation was completed in December 2018 and included the entire site. During that investigation, high trichloroethene (TCE) was detected at the Building 46A area, in one of the groundwater monitoring wells. A second round of PSI field activities was completed in November 2019 that confirmed the December 2018 results as well as led to more questions about the presence of TCE in groundwater around Building 46A. The primary objectives of the effort of the 2020 PSI activities were then presented.

Mr. Werner explained that LHAAP-47 shallow zone groundwater consists of laterally discontinuous sand and clay units and is separated from the continuous sands of the intermediate zone by clay with thin sand laminations. He said that groundwater is generally present in the sand units, but not in the unproductive clay units. Mr. Werner stated that three distinct plumes exist with TCE concentrations greater than the Maximum Contaminant Level (MCL) of 5 micrograms per liter (µg/L). Within the shallow zone groundwater, there are three areas of residual TCE dense non-aqueous phase liquid (DNAPL), defined as TCE concentrations greater than 10,000 µg/L. Mr. Werner said that the three areas of residual DNAPL are present within the extent of the plumes. He explained that samples with concentrations indicative of residual DNAPL were taken from intervals with predominantly clay soils, with some interspersed sand laminations. Mr. Werner presented the contaminated areas within the shallow zone groundwater using the figure on slide 24.

Mr. Rice asked if a decision on how to deal with the DNAPL had been made. Mr. Werner said that the remedies are being evaluated in a revised draft Feasibility Study Addendum that is being prepared. Mr. Werner said that preferred remedy will be presented in the Proposed Plan.

Mr. Werner said that the summary of the upper intermediate zone groundwater is that a single TCE plume defined by TCE concentrations exceeding 5 µg/L was identified. A single area of residual DNAPL was identified within the larger plume defined as TCE concentrations greater than 10,000 µg/L. Contamination was presented in samples taken from the sand unit underlying the clay-dominated unit separating the Shallow and Upper Intermediate Zones. Mr. Werner presented the contaminated areas within the intermediate zone groundwater using the figure on slide 26.

Mr. Werner presented the soil results for the unsaturated soil. TCE exceeded the Medium Specific Concentration (MSC) for industrial use based on groundwater protection (GWP-Ind). The unsaturated soil contamination overlies the extent of the shallow zone groundwater plume centered on Building 46A and the groundwater plume to the northeast. Mr. Werner said that the concentrations did not indicate the presence of a DNAPL source. The highest TCE concentration in soil corresponds with the shallow and upper intermediate zone groundwater residual DNAPL

plumes extending from Building 46A to the north and northeast. Mr. Werner said that elevated TCE concentrations are typically from 21 to 23 feet below ground surface. Mr. Werner used the figure on slide 28 to present the results for soil.

Mr. Werner then presented the objectives for the PDI Work Plan for LHAAP-29 and -18/24. Mr. Werner said that the investigation is being done prior to development of the Remedial Design/Remedial Action Work Plan to help fill in any data gaps. Mr. Werner said that the PDI will evaluate the two trinitrotoluene wastewater lines, the two water cooling lines, the cooling water outfall ditch, and the Building 812 area. Mr. Werner then presented figures showing the areas previously identified as contaminated soil areas along with the planned sample locations for the PDI.

Mr. Rice asked about whether the vertical extent of groundwater contamination at LHAAP-47 has been delineated. Mr. Werner said that the plume is delineated vertically. Mr. Rice asked if there are wells in the deeper aquifer zone that are not contaminated. Ms. Zeiler said that the upper intermediate zone has a thick layer of sand that thins out to the east. Ms. Zeiler said that a lower intermediate zone well near the most contaminated shallow zone well was sampled and the results were much lower; greater than the cleanup level but not DNAPL. Ms. Zeiler said that additional wells will need to be installed below the upper intermediate zone to define vertical extent.

LHAAP-17

Ms. Kyra Donnell from TLI Solutions, Inc. explained that work at LHAAP-17 is being implemented by a joint venture between MMG and TLI Solutions, Inc. Ms. Donnell explained that the project is currently in the work planning phase. The Munitions and Explosives of Concern Investigation Work Plan is under review by the Army. Ms. Donnell said that an Explanation of Significant Difference has been drafted and is currently under legal review. She then explained that the LHAAP-17 Work Plan Addendum to the existing Remedial Design/Remedial Action Work Plan is being prepared for excavation of soil and sifting of soils at LHAAP-17 in consideration of munitions. Ms. Donnell plans to present more details about planned field activities at the April 2021 RAB meeting.

Next RAB Meeting Schedule and Closing Remarks

Ms. Zeiler then discussed the next meeting with the RAB members. It was decided that the next RAB meeting will be held on **Wednesday, April 21, 2021,** with the **meeting starting at 6:00 pm Central Daylight Time**. Ms. Zeiler stated that the plan is to meet in person.

Mr. LeTourneau made a motion to adjourn; Mr. Hall seconded the motion.

Adjourn

The meeting adjourned at 6:55 pm CST.

January 2021 Meeting Attachments and Handouts:

- Color copy of Bhate presentation slides
- GWTP – Processed Groundwater Volumes Handout
- Surface Water Sampling Handout

Longhorn Army Ammunition Plant Quarterly Restoration Advisory Board Meeting

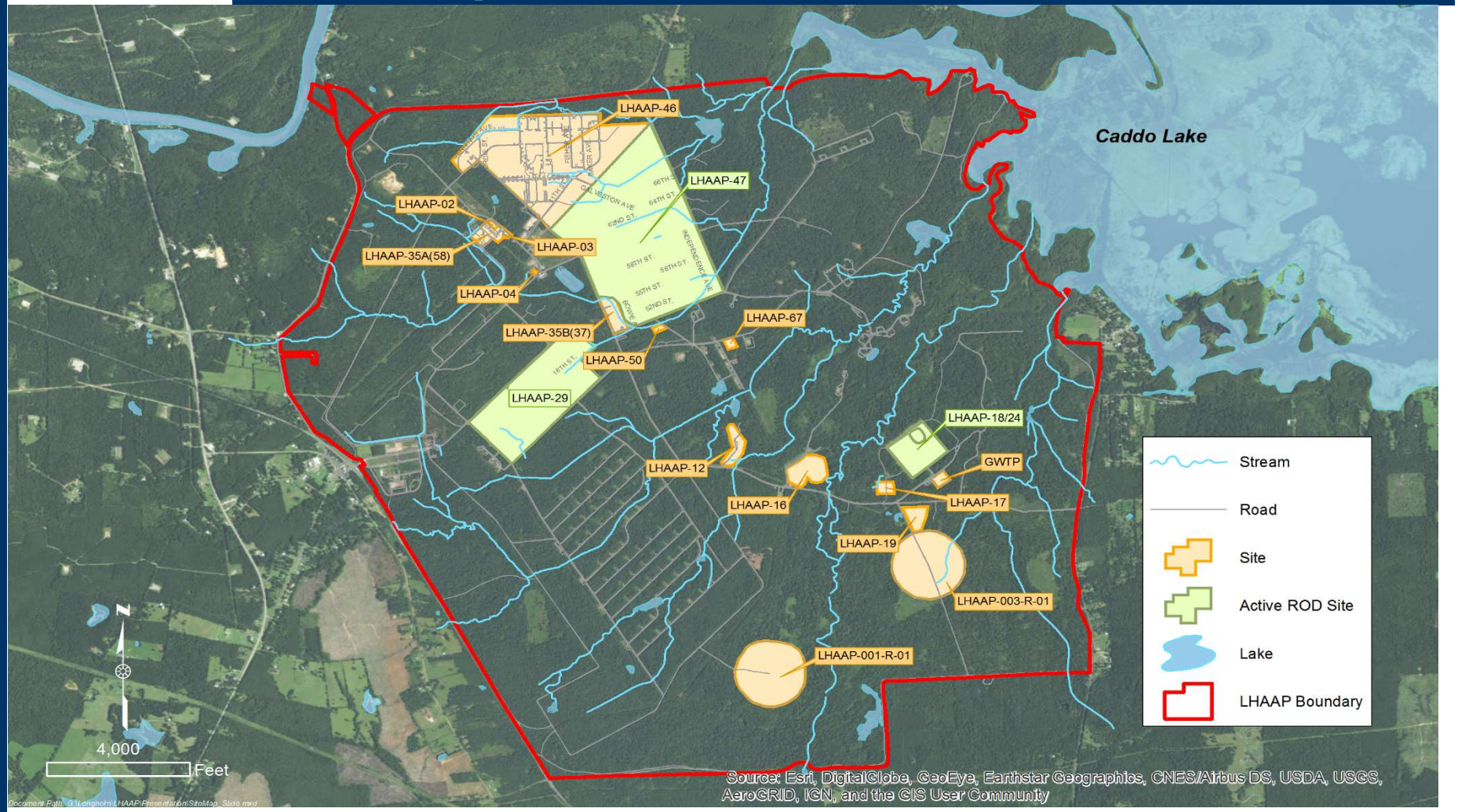
January 20, 2021
6:00 PM CST

APTIM

bhate

Restoration Advisory Board Meeting

Site Map



Abbreviations and Acronyms

µg/L	Micrograms per liter
DERP	Defense Environmental Restoration Program
GPW	Goose Prairie Creek Water Sample
GWP-Ind	Industrial Groundwater Use Protection
GWTP	Groundwater Treatment Plant
HBW	Harrison Bayou Water Sample
J	Estimated laboratory value
LHAAP	Longhorn Army Ammunition Plant
LUC	Land Use Control
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MSC	Medium-Specific Concentration
mV	Millivolts
NV	No Value
PCL	Protective Concentration Level
RAB	Restoration Advisory Board
RA(O)	Remedial Action Operation
TCE	Trichloroethylene
TRRP	Texas Risk Reduction Program

Restoration Advisory Board Meeting

Agenda

06:00 Welcome and Introduction

06:05 Open Items {RMZ}

-Restoration Advisory Board (RAB) Administrative Issues

- o Membership Update
- o Minutes (October 2020 RAB Meeting)

-Purpose of the RAB Meeting

-Ongoing Outreach/Website

-Update on COVID-19

06:15 Defense Environmental Restoration Program (DERP) Update {Bhate}

-Documents in Process and Field Work Completed since last RAB

- o Longhorn Army Ammunition Plant (LHAAP)-04 Remedy Update
- o LHAAP-16 Land Use Control (LUC) Boundaries

-Three Month Look Ahead

-Groundwater Treatment Plant (GWTP) Update

06:45 Other DERP Update

-LHAAP-18/24, -29, and -47 Status {HDR}

-LHAAP-17 Status {MMG-TLI}

06:55 Next RAB Meeting Schedule and Closing Remarks {RMZ}

RAB Administrative Issues

- Membership Update
  - Persons interested in being new members
- Minutes (October 2020 RAB Meeting)

The Army Wants You to be Informed

- The Army is committed to protecting human health and the environment; key to that commitment is engaging the community and increasing public participation in environmental restoration at LHAAP
- You are encouraged to:
  - Attend RAB Meetings and/or become a member of the RAB
  - Visit the Longhorn environmental website at www.longhornaap.com. The website is regularly updated to indicate the upcoming field events at each site including groundwater sampling, monitoring well installations, soil sampling, or remediation activities.
  - Make suggestions for improving communication – the Army welcomes and appreciates community feedback

Update on COVID-19

- Executive Order/Proclamation issued on 2 July 2020 from Governor of Texas
  - Remains in effect until amended, superseded, or rescinded
  - Wear face coverings in public spaces
  - People cannot be in groups larger than 10 and must maintain 6 feet of social distancing from others.
- April 2021 RAB Meeting – To Be Determined

Documents in Process

Site	Document
LHAAP-03	Remedial Action Completion Report
LHAAP-04	Remedial Action Completion Report
LHAAP-16	Remedial Action Completion Report
LHAAP-46	Annual RA(O) Report
LHAAP-50	Annual RA(O) Report
GWTP	Quarterly Evaluation Report: Fourth Quarter (October – December 2020)

Restoration Advisory Board Meeting

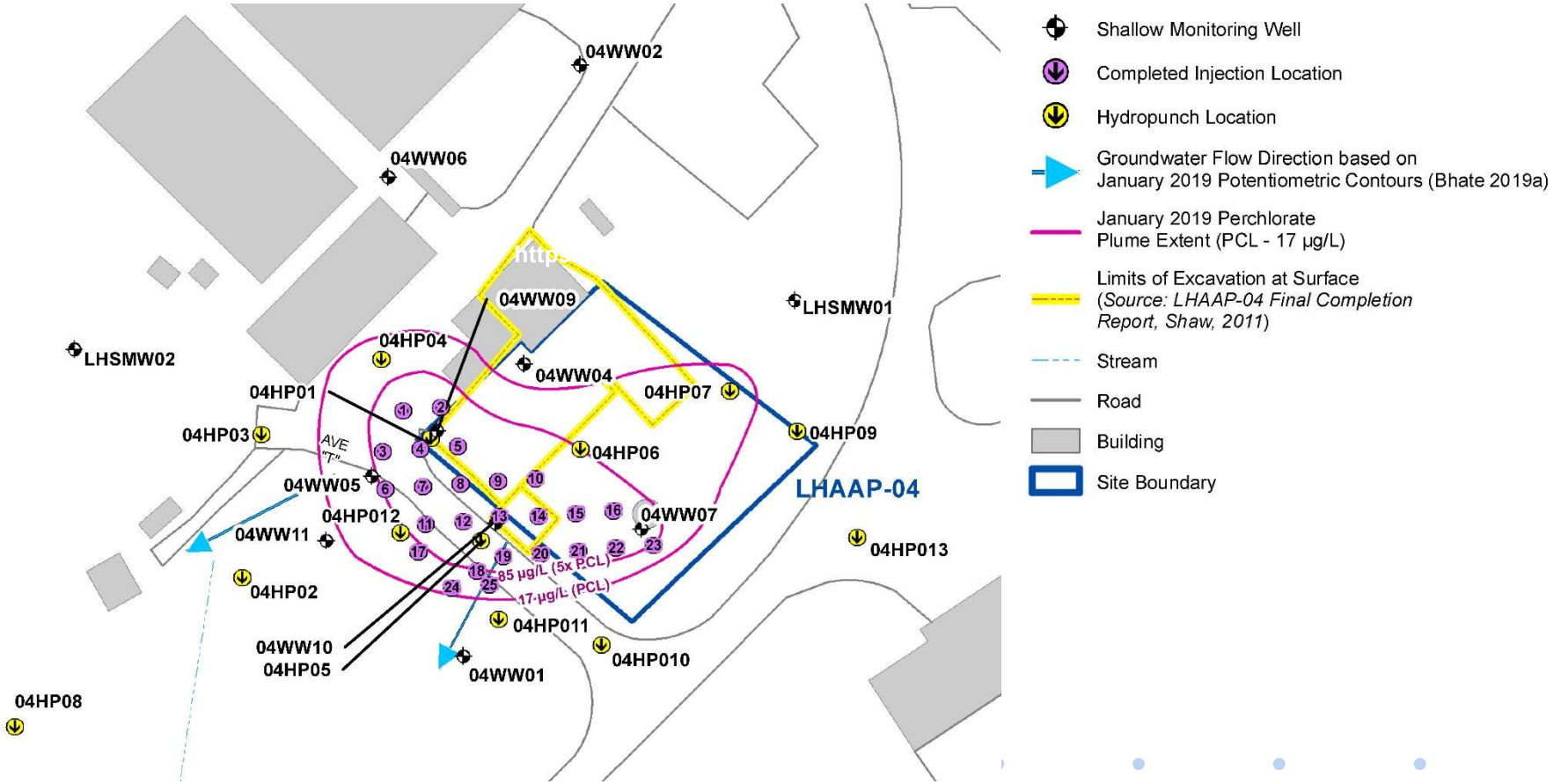
Completed Field Work Since Last RAB Meeting

Site	Activity
LHAAP-04	Year 1 Quarter 4 Performance Sampling (November)
LHAAP-12	2020 Annual Remedial Action Operation (RA(O)) Sampling (December)
LHAAP-16	Year 1 Quarter 3 Performance Sampling (October)
LHAAP-37	Year 4 1st Semi-Annual Sampling (November)
LHAAP-50	Year 1 Quarter 2 Contingency Remedy Performance Sampling (October)
LHAAP-58	Semi-Annual Sampling (December)
LHAAP-67	Year 7 Annual RA(O) Sampling (November)
LHAAP-18/24	Semi-Annual Sampling (December)
Surface Water	Surface Water Sampling (December)

Restoration Advisory Board Meeting

LHAAP-04 Remedy Update

2019 Plume and Injection Locations



Restoration Advisory Board Meeting

LHAAP-04 Pre-injection and Year 1 Performance Sampling

Sampling Results at Key Monitoring Locations

	Location Code		04WW01					04WW05				
	Sample Date		1/22/2019	2/4/2020	5/4/2020	8/10/2020	11/4/2020	1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020
Analyte	Units	PCL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perchlorate												
Perchlorate	µg/L	17	< 2	19	< 0.05	0.561 J	0.246 J	78	< 2	< 0.05	0.399 J	< 0.05
Field Parameters												
Dissolved Oxygen	mg/L	NV	0.15	0.03	0.04	0.05	0.03	1.62	0.09	0.22	0.14	0.15
Oxidation-Reduction Potential	mV	NV	327	-52	-135	-191	-115	163	-88	-90	-66	-36

	Location Code		04WW07					04WW09				
	Sample Date		1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020
Analyte	Units	PCL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perchlorate												
Perchlorate	µg/L	17	110	86	3.51	0.557 J	< 0.05	2,100	18	11.1	3.92	2.02
Field Parameters												
Dissolved Oxygen	mg/L	NV	1.83	0.05	2.12	0.04	0.03	5.78	0.08	0.04	0.03	0.02
Oxidation-Reduction Potential	mV	NV	338	-260	-314	-112	-105	326	-74	-16	-87	-91

	Location Code		04WW10				
	Sample Date		1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020
Analyte	Units	PCL	Result	Result	Result	Result	Result
Perchlorate							
Perchlorate	µg/L	17	10,000	< 2	< 0.05	0.339 J+	0.0888 J
Field Parameters							
Dissolved Oxygen	mg/L	NV	3.59	5.54	2.72	1.03	0.11
Oxidation-Reduction Potential	mV	NV	333	-79	-286	-47	-62

Notes:

Blue highlighting indicates concentrations above the PCL.

< The analyte was not detected above the laboratory reporting limit shown.

J - Estimated: The concentration shown is estimated

J+ - The concentration shown is an estimate with a high bias

µg/L - micrograms per liter

mg/L - milligrams per liter

NV - No PCL value has been established for the analyte.

PCL - Texas Risk Reduction Program Tier 1 Groundwater Residential Protective Concentration Level.

mV - millivolts

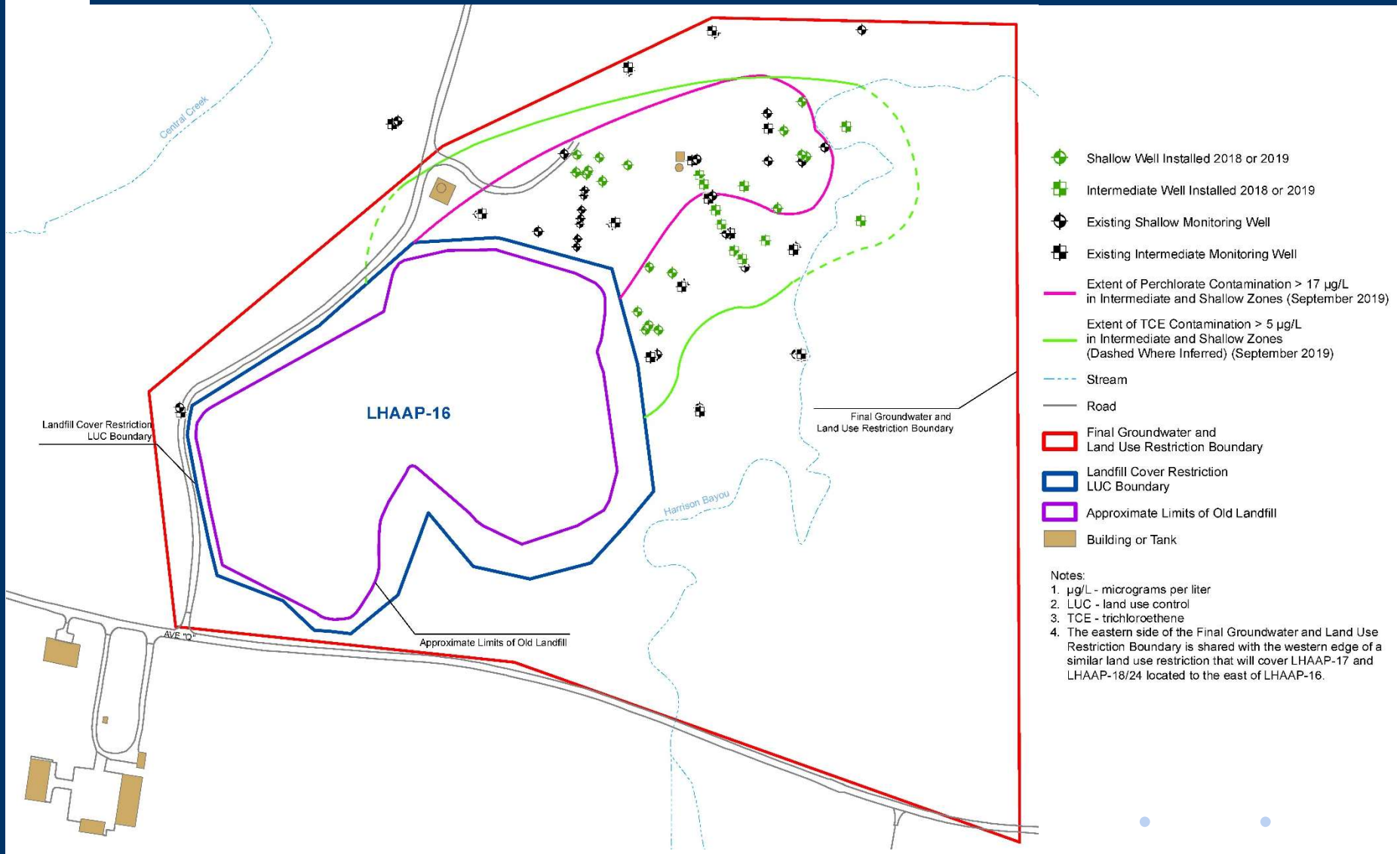
Restoration Advisory Board Meeting

LHAAP-04 Performance Sampling

- Perchlorate in all wells was below the cleanup goal for 3 consecutive quarters
- Dissolved oxygen remains well below 1 milligram per liter (mg/L) in all previously contaminated wells
- Oxidation-reduction potential values remain negative in all previously contaminated wells
- Quarterly monitoring will continue for Year 2
- Next sampling event in February 2021
- LUC Notice to be filed with Harrison County in January 2021

Restoration Advisory Board Meeting

LHAAP-16 Land Use Control Boundaries



LHAAP-16 Land Use Control Boundaries

- Two LUC boundaries approved by United States Environmental Protection Agency (USEPA) and Texas Commission on Environmental Quality (TCEQ)
- Landfill cover restriction protects landfill cover and contents from intrusive activities
- Groundwater use and land use restrictions share the same boundary and limit use of the site to non-residential use and prohibit groundwater use except for environmental sampling and remediation
- Groundwater use restriction boundary extends across Harrison Bayou to the western edge of the planned LHAAP-17 and LHAAP-18/24 LUC boundaries
- LUC Notice to be filed in Harrison County in January 2021

Restoration Advisory Board Meeting

3 Month Look Ahead - Field Work by Bhate Team

Site	Activity
LHAAP-04	Performance Monitoring (February 2021)
LHAAP-16	Year 1 Quarter 4 Remedy Performance Monitoring (January 2021)
LHAAP-50	Year 1 Quarter 3 Contingency Remedy Performance Sampling (January 2021)
Surface Water	1st Quarter Sampling

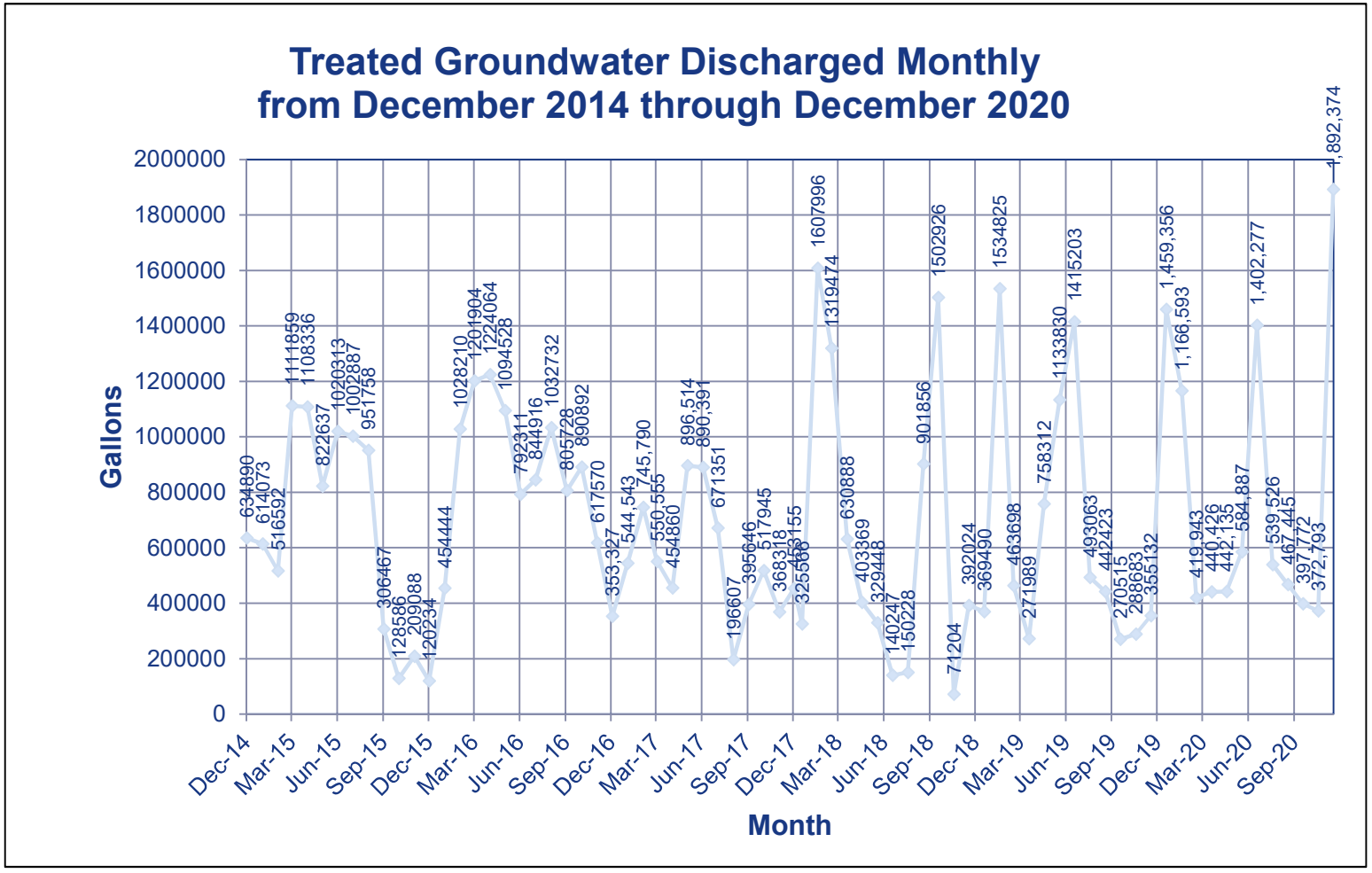
Restoration Advisory Board Meeting

3 Month Look Ahead – Documents by Bhate Team

Site	Document
LHAAP-03	Remedial Action Completion Report to Regulators
LHAAP-04	Finalize Remedial Action Completion Report with LUC Notice Filing
LHAAP-16	Finalize Remedial Action Completion Report with LUC Notice Filing
LHAAP-17	Excavation and Backfill Summary Report to Regulators
LHAAP-46	Finalize RA(O) Report
GWTP and LHAAP-18/24	Quarterly Evaluation Report: Fourth Quarter (October – December 2020)

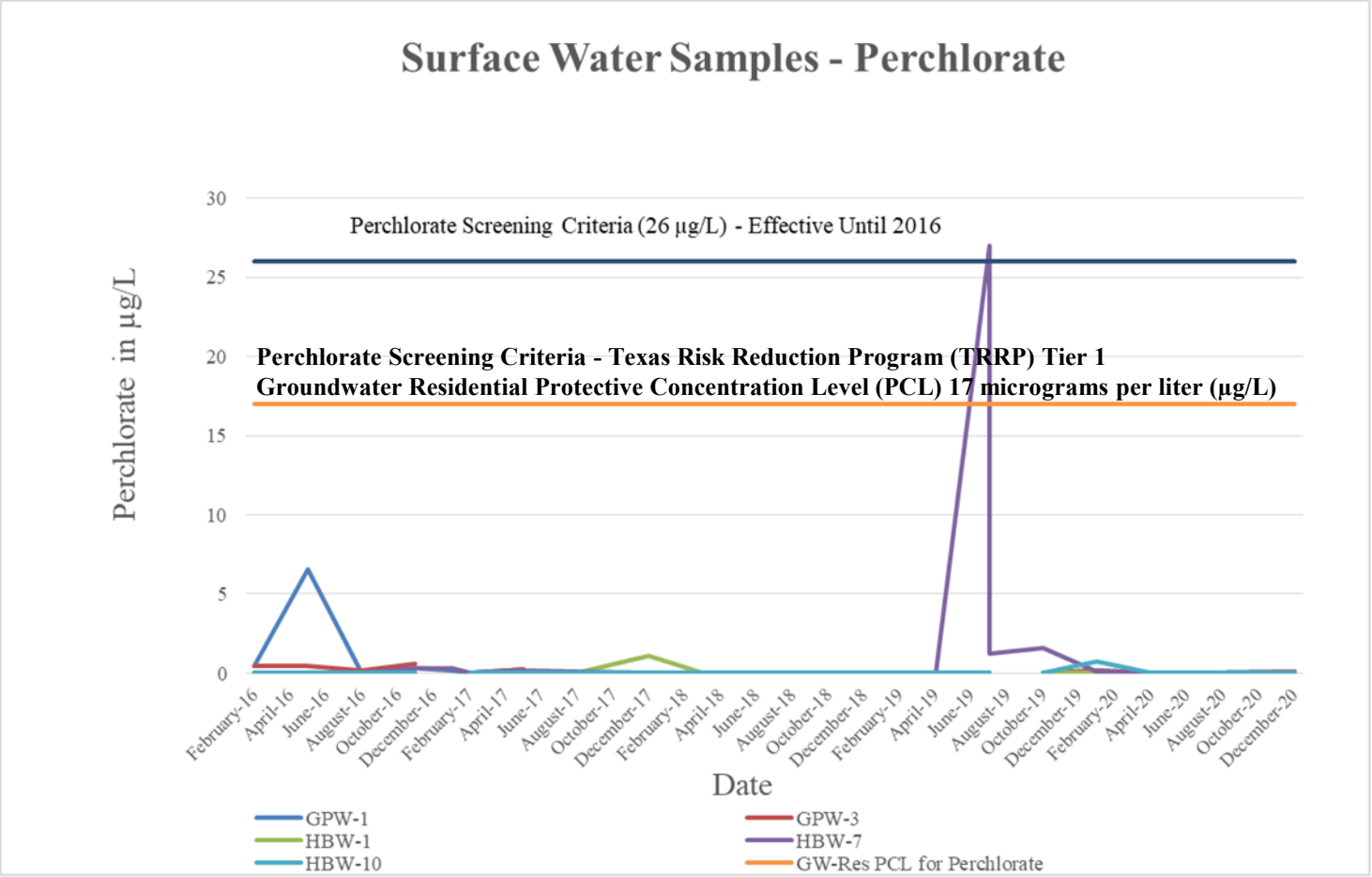
Restoration Advisory Board Meeting

GWTP Update



Restoration Advisory Board Meeting

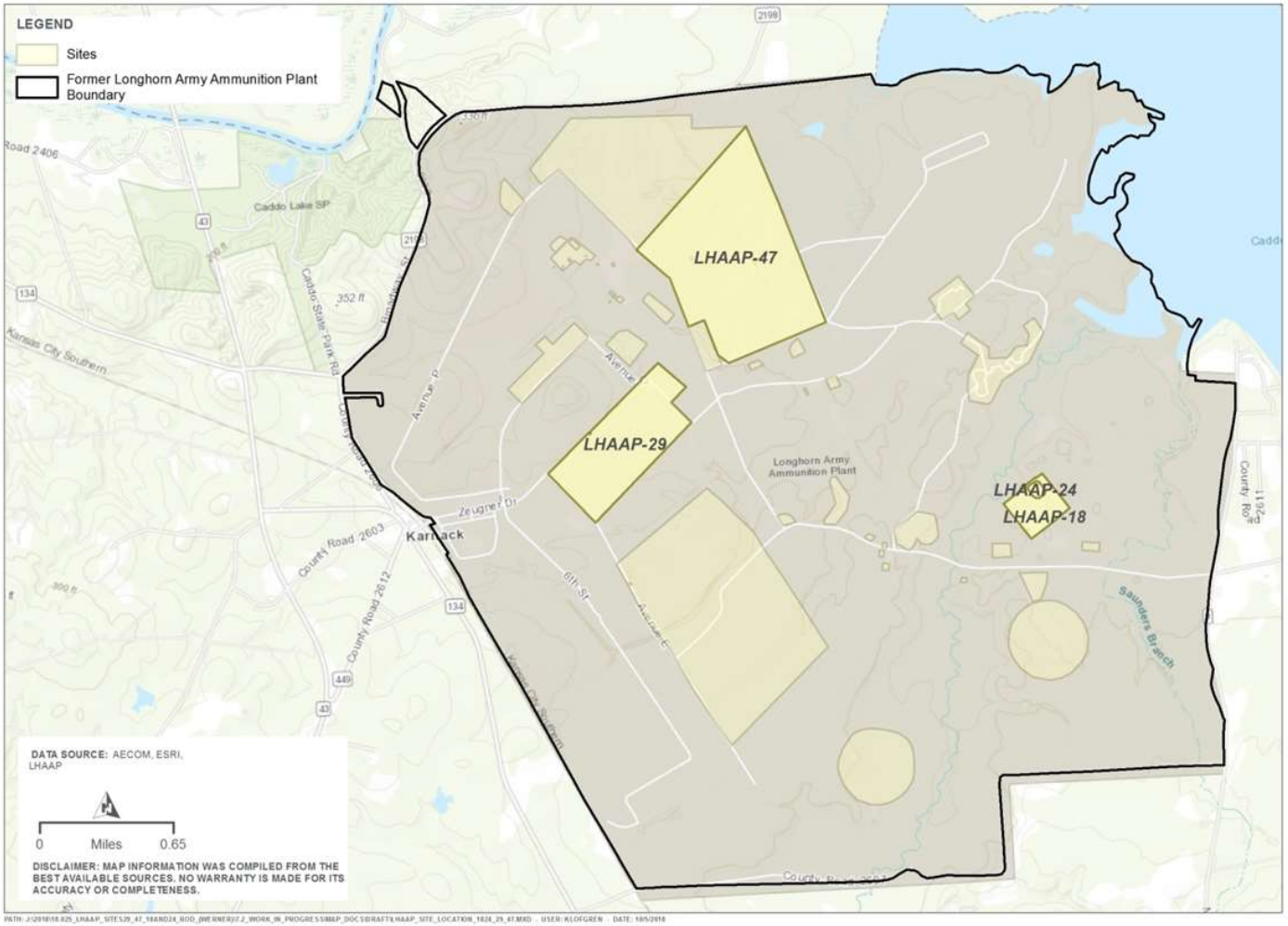
Surface Water Sample Results



Note: Surface water at HBW-7 had a detection of 27 µg/L from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J µg/L.

Restoration Advisory Board Meeting

Other DERP Updates



Restoration Advisory Board Meeting

LHAAP-18/24, -29, and -47 Document Status
3 Month Look Ahead - Documents by HDR Team

Site	Document
LHAAP-18/24	Draft Pre-Design Investigation Work Plan, January 2021
LHAAP-29	Draft Final Pre-Design Investigation Work Plan, January 2021
LHAAP-47	Draft Final Post Screening Investigation Addendum No. 2 Report, January 2021
LHAAP-47	Draft Feasibility Study Addendum, January 2021
LHAAP-47	Draft Revised Proposed Plan, March 2021

Restoration Advisory Board Meeting

Future Field Work by HDR Team

Site	Activity
LHAAP-18/24	Pre-Design Investigation Field Work, March - April 2021
LHAAP-29	Pre-Design Investigation Field Work, February – March 2021

Restoration Advisory Board Meeting

Summary of LHAAP-47 Additional Post Screening Investigation Addendum No. 2 (Spring/Summer 2020)

- **Primary objectives of PSI Addendum No. 2 field effort:**
  - **Determine whether or not groundwater is present in the Shallow Zone aquifer near Building 46A;**
  - **Determine if groundwater in the Shallow Zone is impacted by VOCs and to what extent;**
  - **Determine if unsaturated soil overlying historical high groundwater levels in the Shallow Zone has been impacted by VOCs at Building 46A and to what extent;**
  - **Define the extent of residual TCE dense non-aqueous phase liquid; and**
  - **Eliminate data gaps by defining the spatial boundary of VOC (TCE) contamination in the Upper Intermediate Zone groundwater.**

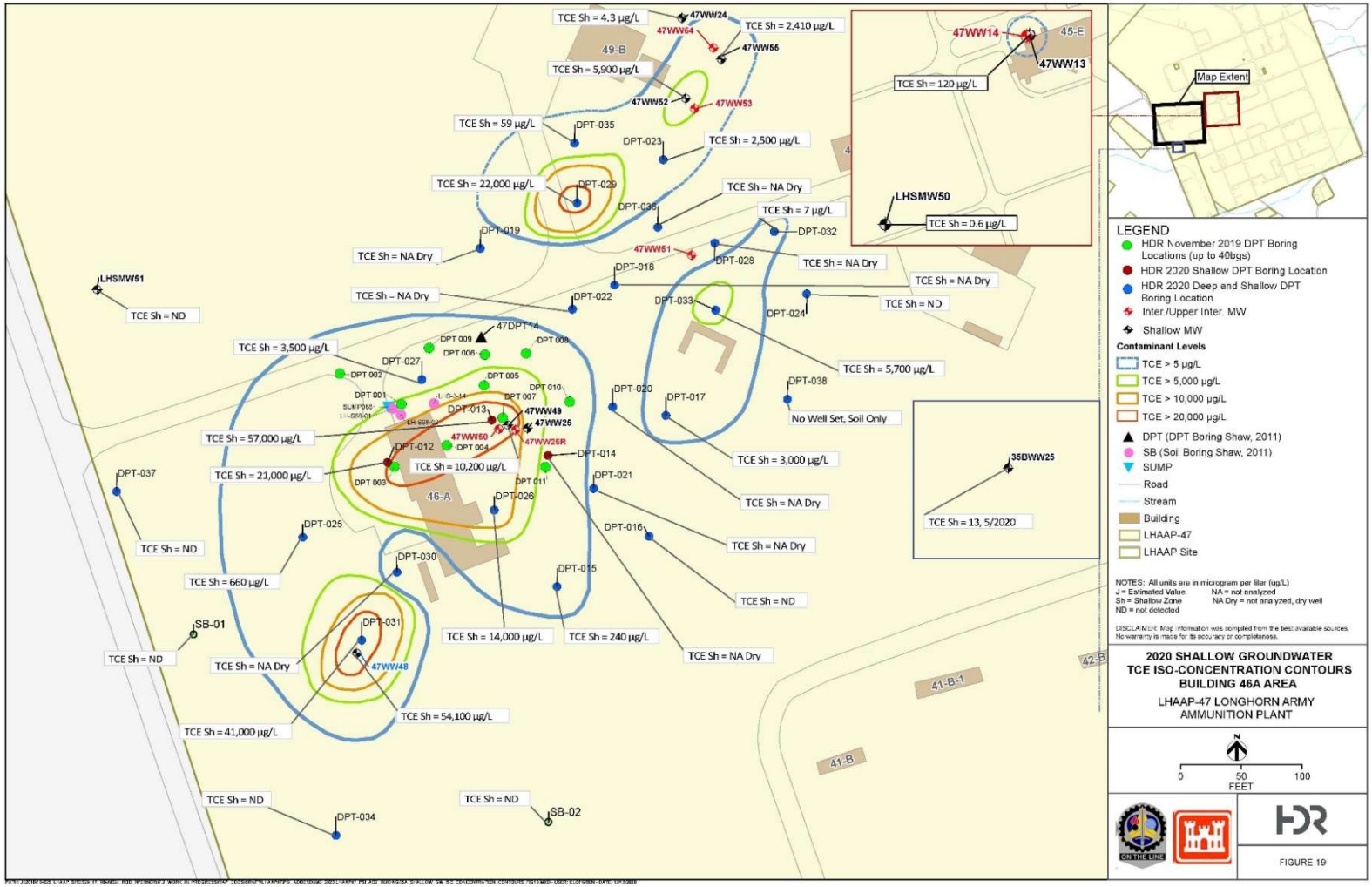
Restoration Advisory Board Meeting

Summary of LHAAP-47 Additional Post Screening Investigation Addendum No. 2: Shallow Zone Groundwater (Spring/Summer 2020)

- The shallow zone groundwater consists of laterally discontinuous sand and clay units and is separated from the continuous sands of the intermediate zone by clay with thin sand laminations.
- Shallow Zone:
  - Groundwater is generally present in the sand units, but not in the unproductive clay units.
  - Three distinct plumes exist with trichloroethene (TCE) concentrations greater than the Maximum Contaminant Level (MCL) of 5 µg/L.
  - Three areas of residual TCE dense non-aqueous phase liquid, defined as TCE concentrations greater than 10,000 µg/L.
  - Largest plume is near Building 46A, with concentrations reported at 57,000 µg/L.
  - Smaller area defined within the larger TCE plume southwest of Building 46A.
  - Third (smallest area) centered on DPT-029 (22,000 µg/L).
  - Three areas of residual dense non-aqueous phase liquid are present within the extent of the plumes.
  - Samples with concentrations indicative of residual dense non-aqueous phase liquid were taken from intervals with predominantly clay soils, with some interspersed sand laminations.

Restoration Advisory Board Meeting

Summary of LHAAP-47 Additional Post Screening Investigation Addendum No. 2: Shallow Groundwater TCE Plumes(Spring/Summer 2020)



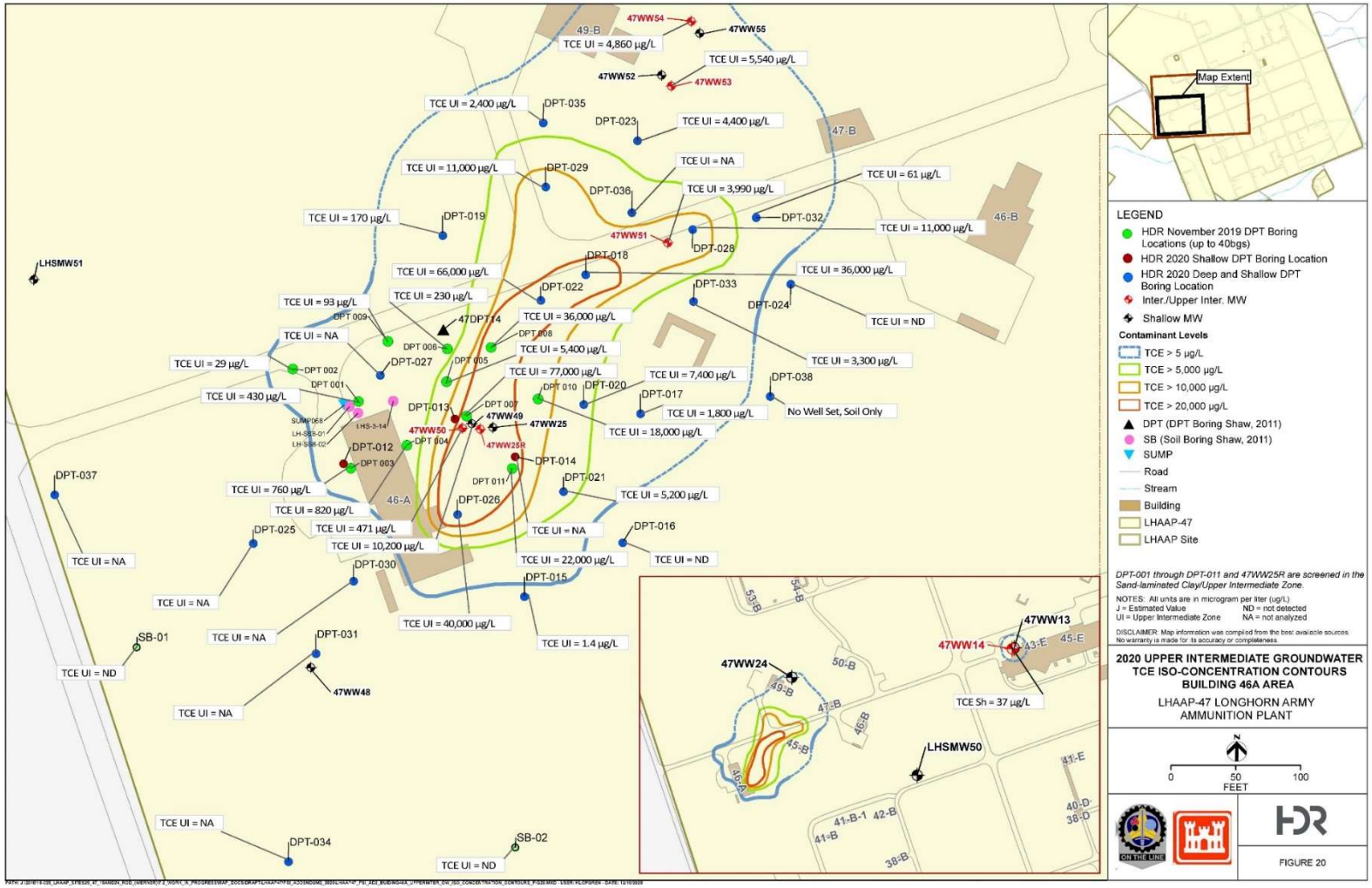
Restoration Advisory Board Meeting

Summary of LHAAP-47 Additional Post Screening Investigation Addendum No. 2: Upper Intermediate Zone Groundwater (Spring/Summer 2020)

- Upper Intermediate Zone Groundwater
  - Single TCE plume defined by TCE concentrations exceeding 5 µg/L.
  - Single area of residual dense non-aqueous liquid within the larger plume defined as TCE concentrations greater than 10,000 µg/L.
  - TCE concentrations in the Upper Intermediate Zone ranged from 11,000 µg/L to 66,000 µg/L.
  - Results were reported in samples taken from the sand unit underlying the clay-dominated unit separating the Shallow and Upper Intermediate Zones.

Restoration Advisory Board Meeting

Summary of LHAAP-47 Additional Post Screening Investigation Addendum No. 2: Upper Intermediate Zone Groundwater TCE Plume



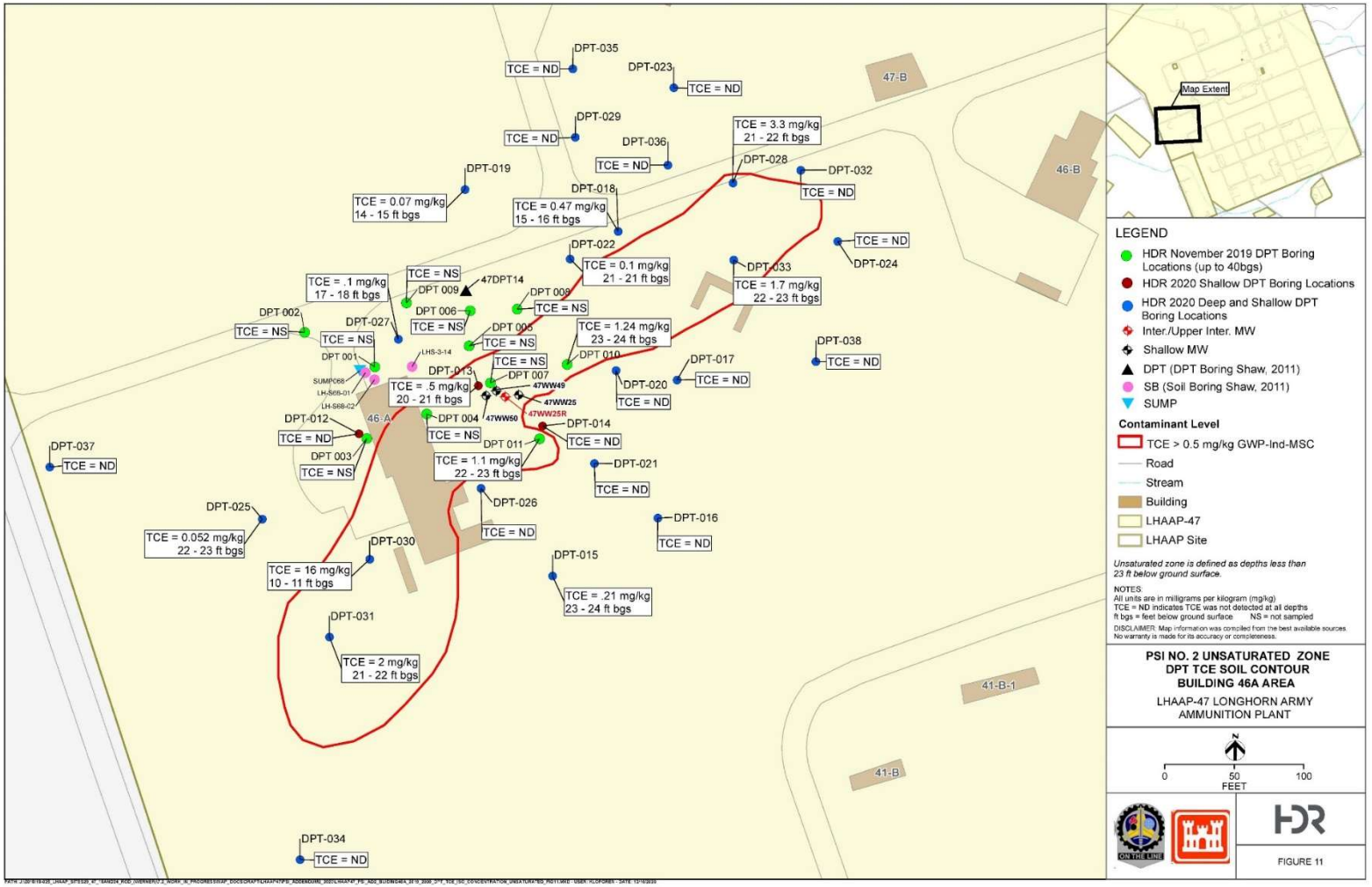
Restoration Advisory Board Meeting

Summary of LHAAP-47 Additional Post Screening Investigation Addendum No. 2: Soil

- Unsaturated soil results indicate an area of contamination with TCE concentrations exceeding the Medium Specific Concentration (MSC) for industrial use based on groundwater protection (GWP-Ind) of 0.5 milligrams per kilogram (mg/kg).
- Contaminated unsaturated soil generally overlies the extent of the shallow zone groundwater plume centered on Building 46A and the smaller plume to the northeast.
- Unsaturated soil TCE concentrations ranged from 0.5 mg/kg to 3.3 mg/kg with one outlier of 16 mg/kg.
- Detected concentrations do not indicate the presence of dense non-aqueous phase liquid source (e.g., concentrations in soil greater than 1% by mass or 10,000 mg/kg).
- Highest (greater than 10 mg/kg) TCE concentrations reported in saturated soils coincide with the shallow and upper intermediate zone groundwater residual dense non-aqueous phase liquid plumes extending around Building 46A.

Restoration Advisory Board Meeting

Summary of LHAAP-47 Additional Post Screening Investigation Addendum No. 2: Soil TCE Isoconcentrations



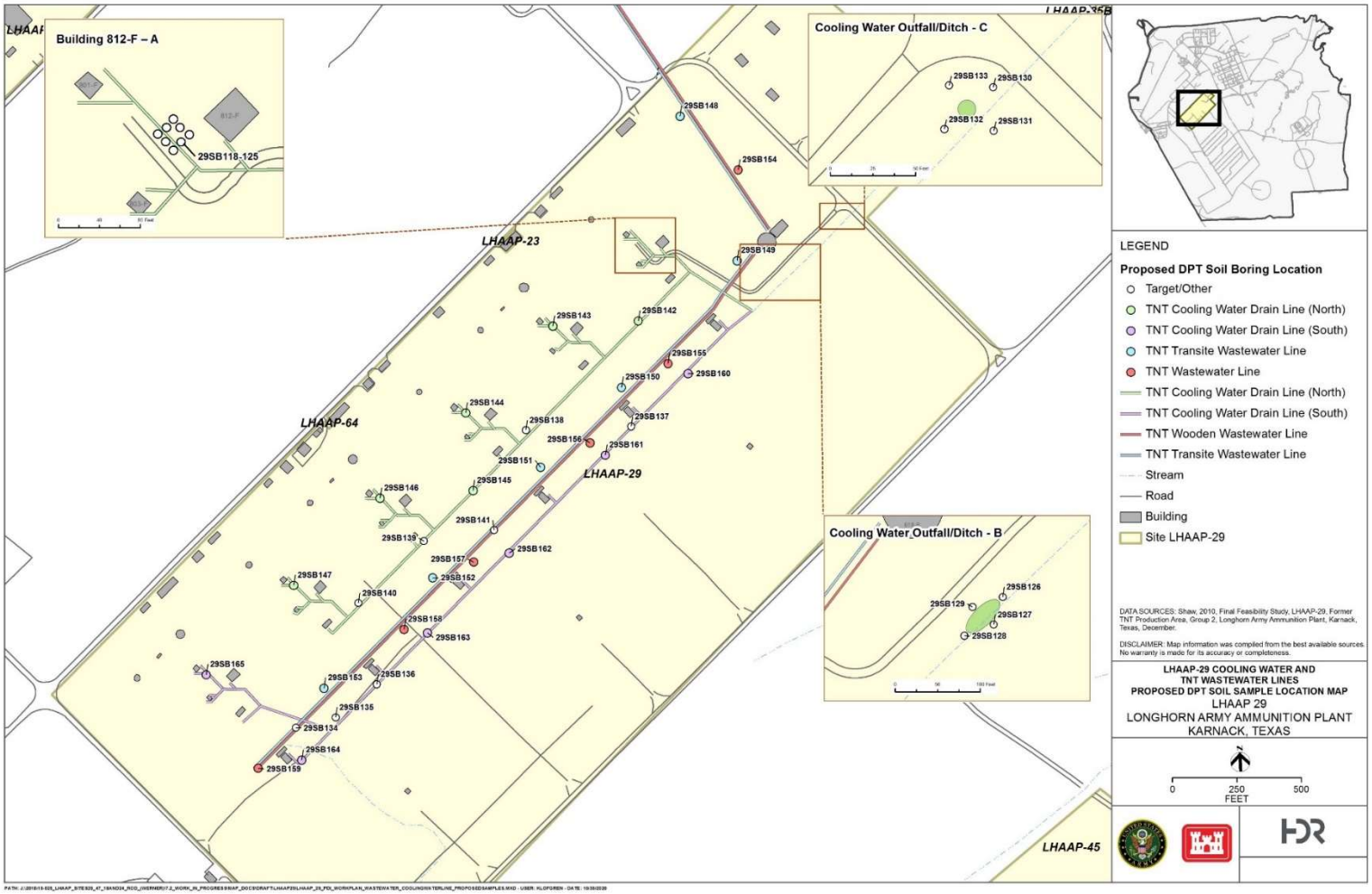
Restoration Advisory Board Meeting

Draft LHAAP-29 Pre-Design Work Plan

- **Primary objectives of Pre-Design field effort:**
  - **Further evaluate the extent and volume of explosives-contaminated soil present at levels exceeding the TCEQ MSC GWP-Ind cleanup levels at former Building 812-F;**
  - **Further evaluate the extent and volume of explosives-contaminated soil present at levels exceeding the TCEQ MSC GWP-Ind cleanup levels at the cooling water outfall/ditch;**
  - **Further evaluate the extent and volume of explosives-contaminated soil, if present at levels exceeding the TCEQ MSC GWP-Ind cleanup levels, located adjacent to the north and south cooling water lines and wooden and transite trinitrotoluene wastewater lines; and**
  - **Provide extent and volume data for contaminated soil that supports development of the Remedial Design.**

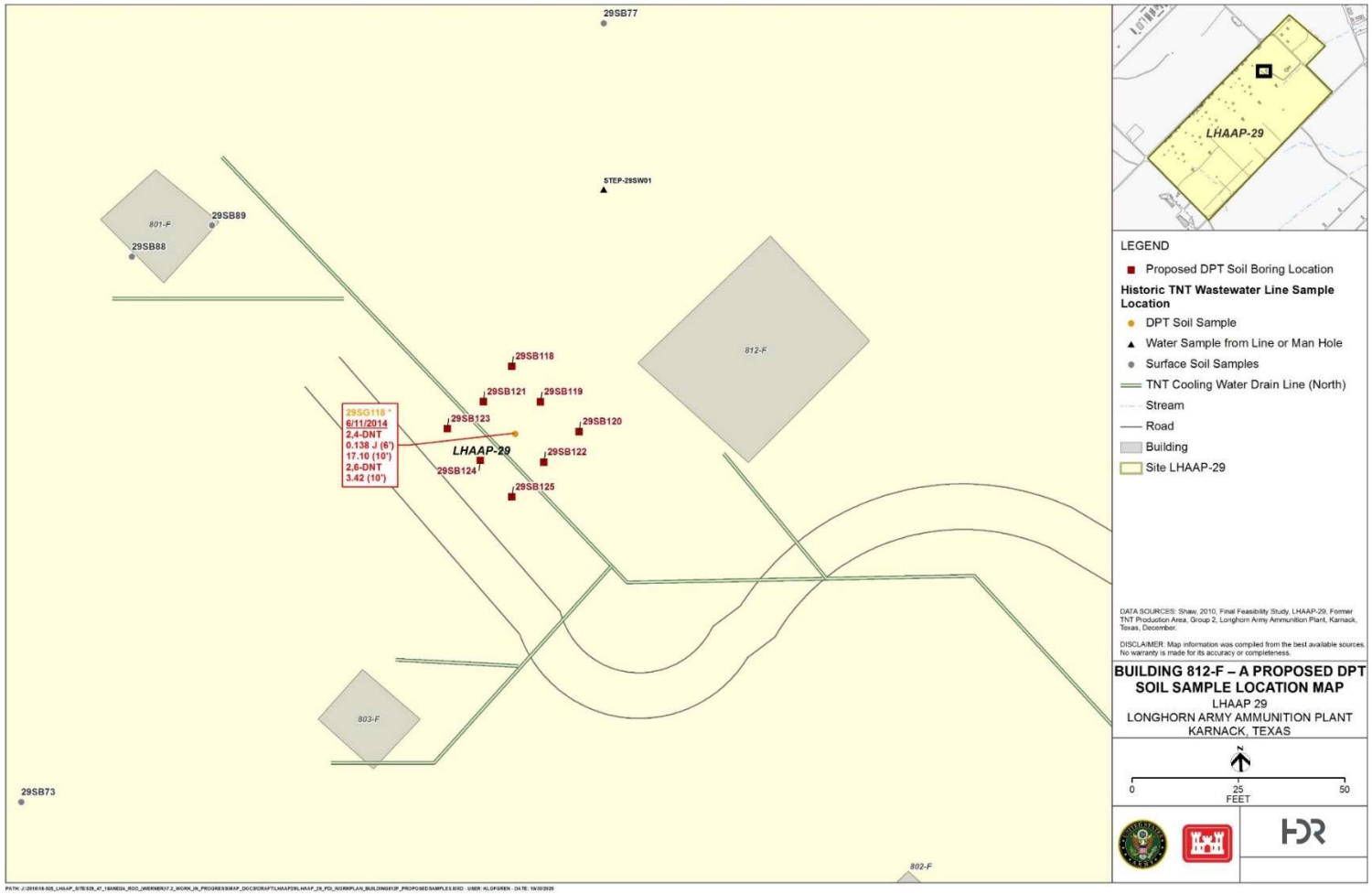
Restoration Advisory Board Meeting

Planned Pre-Design Investigation Sample Locations: Main Production Area



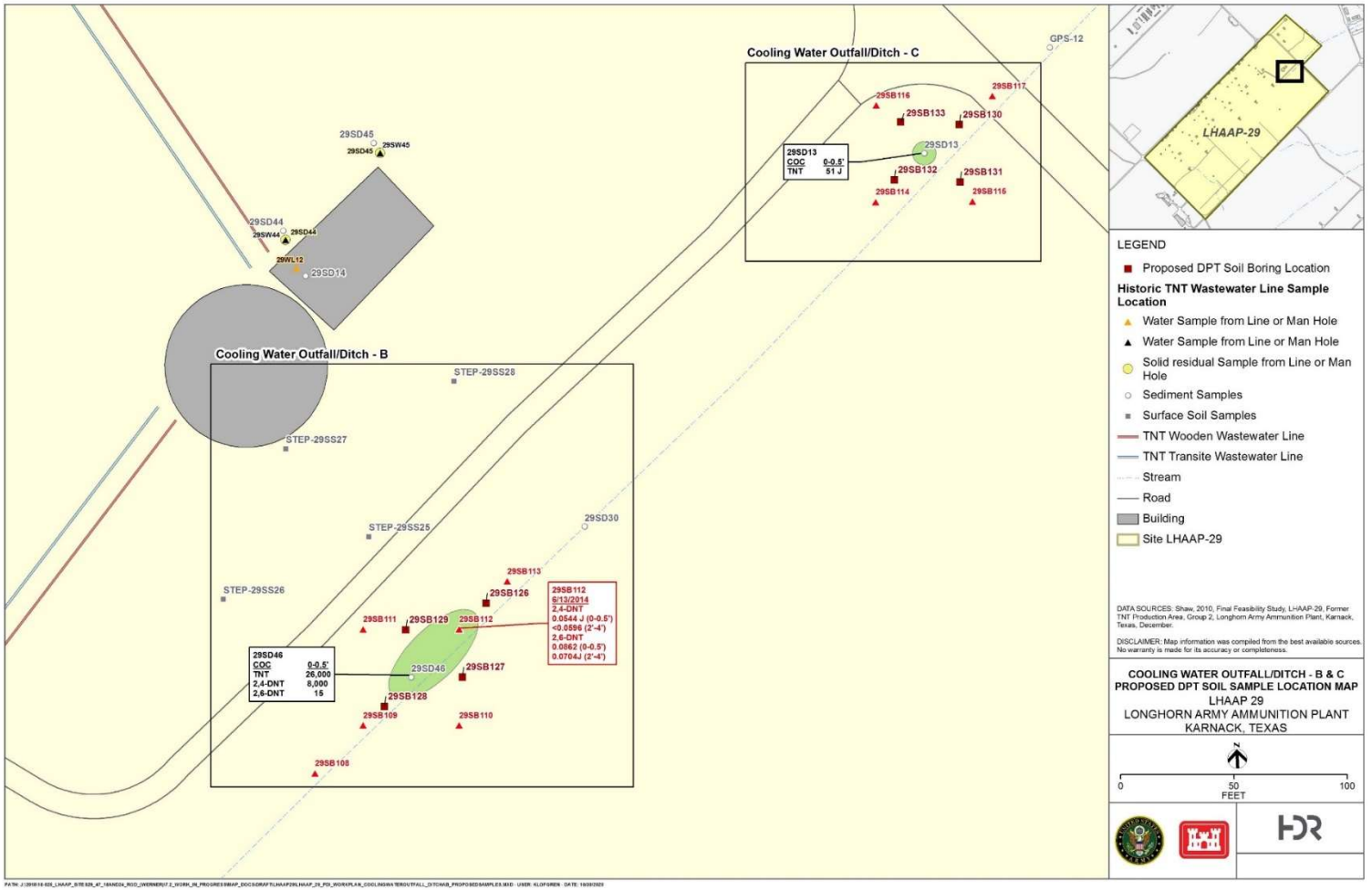
Restoration Advisory Board Meeting

Planned Pre-Design Investigation Sample Locations: Building 812-F Area



Restoration Advisory Board Meeting

Planned Pre-Design Investigation Sample Locations: Cooling Water Outfall/Ditch



Restoration Advisory Board Meeting

LHAAP-17 Document Status 3 Month Look Ahead - Documents by MMG-TLI JV

Site	Document
LHAAP-17	Munitions and Explosives of Concern Investigation Work Plan (Uniform Federal Policy-Quality Assurance Project Plan format), February 2021
LHAAP-17	Explanation of Significant Difference, January 2021
LHAAP-17	Remedial Design/Remedial Action Work Plan Addendum, March 2021

Next RAB Meeting Schedule & Closing Remarks

- Schedule April 2021 RAB Meeting
- Other Issues/Remarks
- Thank you for coming

Groundwater Treatment Plant - Processed Groundwater Volumes

The amount of groundwater treated is determined by measuring the number of gallons of processed water discharged.

Processed Water Discharged Data (in gallons)

Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
1,041,491	848,356	804,822	792,148	665,883	818,872	791,306	568,812	776,904	748,377	690,052	617,199

Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09
655,059	619,274	726,118	552,299	598,144	433,800	488,807	526,958	387,644	0	414,853	735,716

Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
808,322	636,306	727,492	391,898	695,343	802,656	894,731	962,121	1,257,977	1,314,924	1,041,495	1,136,547

Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
956,567	705,805	849,712	811,679	668,281	1,090,348	817,325	900,338	916,552	784,369	652,524	733,456

Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
748,102	658,250	684,903	865,453	725,000*	730,000*	980,000*	630,000*	0	0	0	349,012

Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
617,037	607,610	560,436	869,710	751,213	641,708	699,776	746,885	392,719	962,890	843,913	716,057

Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14
813,974	727,442	706,416	552,657	738,691	844,095	811,346	972,913	611,505	626,253	573,601	575,376

Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15
440,877	572,479	634,890	614,073	516,592	1,111,859	1,108,336	822,637	1,020,313	1,002,887	951,758	306,467

Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
128,586	209,088	120,234	454,444	1,028,210	1,201,904	1,224,064	1,094,528	792,311	844,916	1,032,732	805,728

Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17
890,892	617,570	353,327	544,543	745,790	550,555	454,860	896,514	890,391	528,538	195,198	961,324

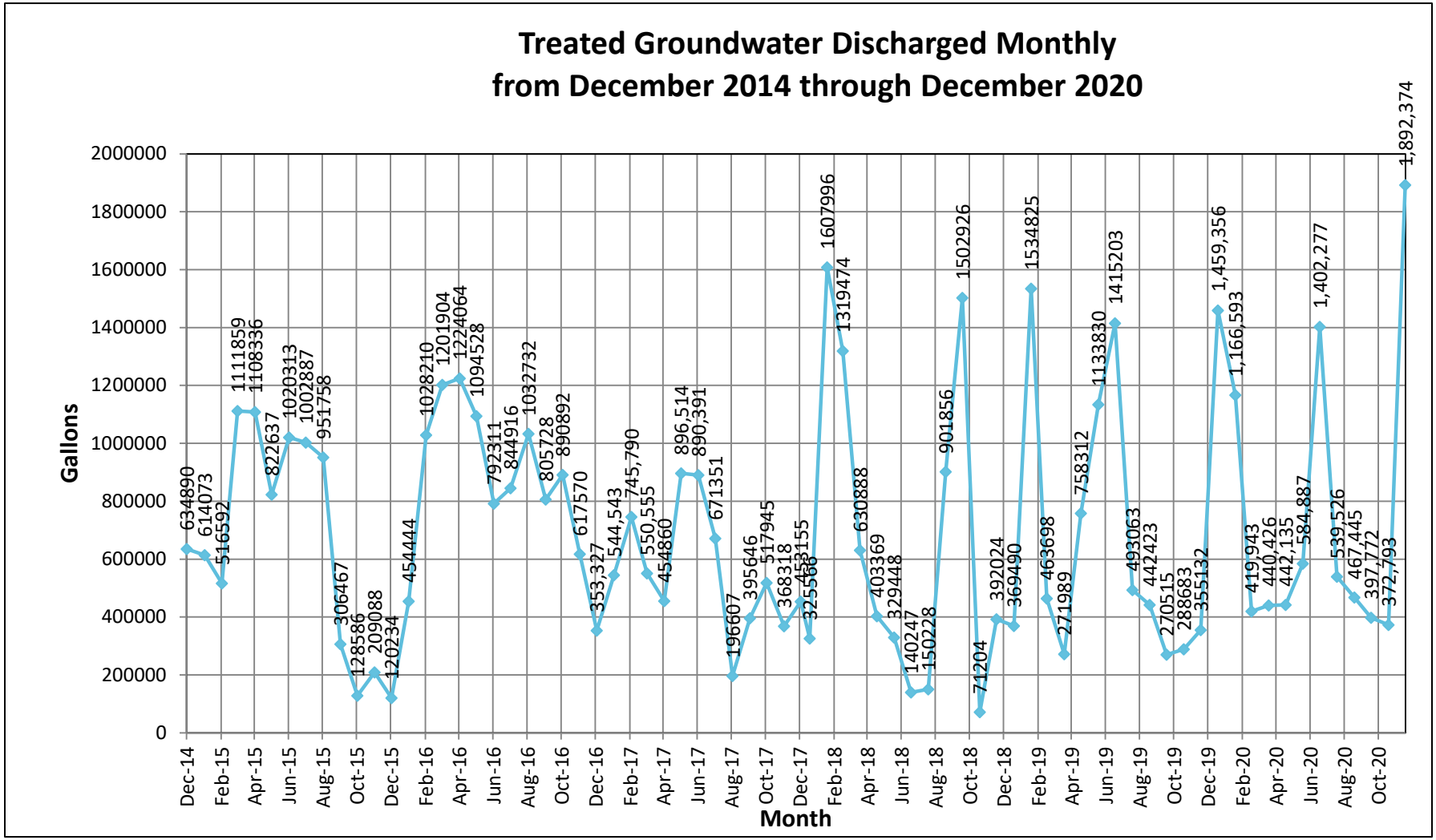
Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul - 18	Aug-18	Sep-18
517,945	368,318	453,155	325,566	1,607,996	1,319,474	630,888	403,369	329,448	140,247	150,228	901,856

Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul - 19	Aug-19	Sep-19
1,502,926	71,204	392,024	369,490	1,534,825	463,698	271,989	758,312	1,133,830	1,415,203	493,063	442,423

Oct-19	Nov-19	Dec-19	Jan -20	Feb -20	Mar -20	Apr -20	May -20	Jun -20	Jul -20	Aug -20	Sep -20
270,515	288,683	355,132	1,459,356	1,166,593	419,943	440,426	442,135	584,887	1,402,277	539,526	467,445

Oct-20	Nov-20	Dec-20									
397,772	372,793	1,892,374									

*Indicates Estimate


Treated Groundwater Discharged Monthly
from December 2014 through December 2020
Gallons
Month
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
Dec-14
Feb-15
Apr-15
Jun-15
Aug-15
Oct-15
Dec-15
Feb-16
Apr-16
Jun-16
Aug-16
Oct-16
Dec-16
Feb-17
Apr-17
Jun-17
Aug-17
Oct-17
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Feb-18
Apr-18
Jun-18
Aug-18
Oct-18
Dec-18
Feb-19
Apr-19
Jun-19
Aug-19
Oct-19
Dec-19
Feb-20
Apr-20
Jun-20
Aug-20
Oct-20
634890
614073
516592
1111859
1108336
822637
1020313
1002887
951758
306467
128586
209088
120234
454444
1028210
1201904
1224064
1094528
792311
844916
1032732
805728
890892
617570
353,327
544,543
745,790
550,555
454860
896,514
890,391
671351
196607
395646
517945
368318
453155
325568
1607996
1319474
630888
403369
329448
140247
150228
901856
1502926
71204
392024
369490
1534825
463698
271989
758312
1133830
1415203
493063
442423
270515
288683
355132
1,459,356
1,166,593
419,943
440,426
442,135
584,887
1,402,277
539,526
467,445
397,772
372,793
1,892,374

Water Discharge Location and Volume (Gallons)

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Dec-16	0	236,688	0	0	0
Jan-17	0	0	0	0	0
Feb-17	0	0	0	0	14,355
Mar-17	127,242	0	0	0	14,400
Apr-17	113,038	0	236,821	0	0
May-17	0	0	534,155	0	0
Jun-17	958,404	0	294,550	490,574	0
Jul-17	0	0	528,538	0	0
Aug-17	0	0	195,197	0	0
Sep-17	651,434	0	309,980	651,434	0
Oct-17	0	0	517,945	0	0
Nov-17	0	0	368,318	0	0
Dec-17	560,350	0	453,155	560,350	0
Jan-18	325,566	0	253,177	325,566	0
Feb-18	1,607,996	0	62,017	1,430,634	0
Mar-18	1,319,474	0	0	870,816	0
Apr-18	630,888	0	0	630,888	0
May-18	403,369	0	0	403,369	0
Jun-18	193,669	0	135,779	0	0
Jul -18	0	0	140,247	0	0
Aug -18	49,409	0	100,819	0	0
Sep-18	585,397	0	316,459	524,484	0
Oct-18	1,409,106	0	93,820	1,016,285	0
Nov-18	71,204	0	0	0	0
Dec-18	392,024	0	0	0	0
Jan-19	369,490	0	0	369,490	0
Feb-19	1,534,825	0	0	1,326,485	0
Mar-19	463,698	0	0	83,250	0
Apr-19	271,989	0	0	0	0
May-19	758,312	0	0	253,817	0
Jun-19	1,133,830	0	0	847,918	0

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Jul -19	1,415,203	0	0	903,001	0
Aug-19	374,629	0	118,434	0	0
Sep-19	0	0	442,423	0	0
Oct-19	0	0	270,515	0	0
Nov-19	115,503	0	173,180	0	0
Dec-19	318,248	0	36,884	0	0
Jan-20	1,459,396	0	0	1,115,183	0
Feb -20	1,166,593	0	0	741,954	0
Mar -20	419,943	0	0	0	0
Apr -20	440,426	0	0	0	0
May -20	442,135	0	0	0	0
June -20	584,887	0	0	0	0
July -20	1,402,277	0	0	984,393	0
Aug -20	216,197	0	323,359	0	0
Sep -20	0	0	467,445	0	0
Oct -20	0	0	397,772	0	0
Nov -20	0	0	372,793	0	0
Dec -20	1,892,374	0	60,199	1,571,432	0

Harrison Bayou and Goose Prairie Creek – Perchlorate Data

Surface water samples are collected quarterly from each location in Harrison Bayou and Goose Prairie Creek, unless the sampling location is dry.

Surface Water Sample Data (in micrograms per liter)

Quarter	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Creek Sample ID	**Jul 1999**	**Sep 1999**	**Feb 2000**	**Apr 2000**	**Aug 2000**	**Dec 2000**	**Feb 2001**	**Apr 2001**	**July 2001**	**Oct 2001**	**Jan 2002**
GPW-1	<1.0 U	-	4	<4.0 U	<4.0 U	<4.0 U	-	2.65	<4.0 U	<4.0 U	<4.0 U
GPW-3	<1.0 U	<4.0 U	17	8	<4.0 U	<4.0 U	-	2.28	<4.0 U	<4.0 U	<4.0 U
HBW-1	-	<8.0 U	310	23	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-7	-	<8.0 U	370	110	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-10	-	<8.0 U	905	650	<4.0 U	-	<4.0 U	-	<4.0 U	-	-

Quarter	2nd	3rd	4th	1st	2nd	3rd	3rd	4th	2nd	3rd	4th
Creek Sample ID	**June 2002**	**Sept 2002**	**Dec 2002**	**Feb 2003**	**June 2003**	**Aug 2003**	**July 2004**	**Dec 2006**	**May 2007**	**Aug 2007**	**Dec 2007**
GPW-1	<4.0 U	<4.0 U	18.3	18.6	59.9	-	2.25	-	<1.0 U	<1.0 U	10.7
GPW-3	<4.0 U	<4.0 U	5.49	12.6	14.7	-	2.2	-	<1.0 U	<1.0 U	7.48
HBW-1	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	99.3	<0.2 U	<1.0 U	<1.0 U	122	<1.0 U
HBW-7	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	<4.0 U	<0.2 U	<1.0 U	<1.0 U	1.02	<1.0 U
HBW-10	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	-	<0.2 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U

Quarter	1st	2nd	3rd	4th	2nd	3rd	3rd	3rd	4th	1st	2nd
Creek Sample ID	**Mar 2008**	**Jun 2008**	**Sep 2008**	**Dec 2008**	**May 2009**	**Jul 2009**	**Aug 2009**	**Sep 2009**	**Dec 2009**	**Mar 2010**	**Jun 2010**
GPW-1	27	<0.5 U	<0.5 U	<0.22 U	16	<4 U	NS	<1.2 U	3.7	1.3 J	<0.6 U
GPW-3	21.9	9.42	1.1	<0.22 U	8.9	<4 U	NS	<0.6 U	2.8	1.8 J	<0.6 U
HBW-1	<0.5 U	<0.5 U	<0.5 U	<0.22 U	<0.55 U	<4 U	NS	<1.5 U	<0.275 U	1.5 U	<0.6 U
HBW-7	<0.5 U	<0.5 U	<0.5 U	<0.22 U	<0.55 U	<4 U	24	<1.2 U	<0.275 U	1.5 U	<0.6 U
HBW-10	<0.5 U	<0.5 U	<0.5 U	<0.22 U	<0.55 U	<4 U	NS	<1.5 U	<0.275 U	1.2 U	<0.6 U

Quarter	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Creek Sample ID	**Sep 2010**	**Dec 2010**	**Mar 2011**	**Jun 2011**	**Sep 2011**	**Dec 2011**	**Mar 2012**	**Jun 2012**	**Not Applicable**	**Jan & Feb 2013**	**Mar 2013**
GPW-1	Dry	<0.1 U	8.7	Dry	Dry	1.76	0.163 J	Dry	NS	1.65	0.735
GPW-3	Dry	0.199 J	0.673	Dry	Dry	1.31	0.261	Dry	NS	1.74	0.754
HBW-1	Dry	<0.1 U	<0.2 U	Dry	Dry	<0.1 U	<0.1 U	Dry	NS	<0.2 U	<0.2 U
HBW-7	Dry	<0.1 U	<0.2 U	Dry	Dry	0.171 J	<0.1 U	Dry	NS	<0.2 U	<0.2 U
HBW-10	Dry	<0.1 U	<0.2 U	Dry	Dry	<0.1 U	<0.1 U	Dry	NS	<0.2 U	<0.2 U

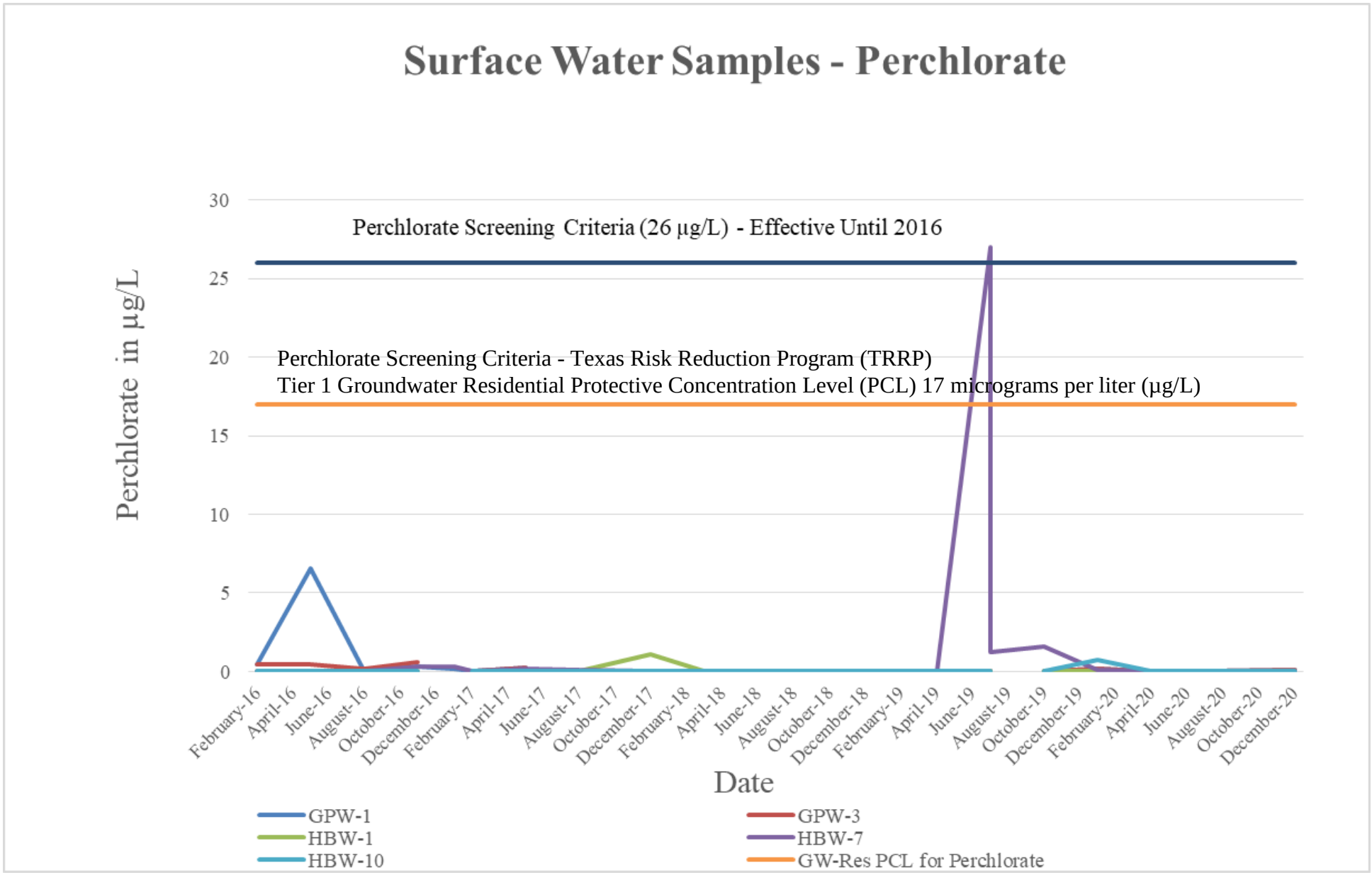
Quarter	2nd	3rd	4th	1st	2nd	3nd	4th	1st	2nd	3rd	4th
Creek Sample ID	**Jun 2013**	**Sept 2013**	**Dec 2013**	**Feb 2014**	**May 2014**	**Aug 2014**	**Nov 2014**	**Feb 2015**	**May 2015**	**Aug 2015**	**Nov 2015**
GPW-1	Dry	<0.2 U	Dry	0.766	Dry	Dry	0.244 J	0.311 J	0.156 J	Dry	0.142 J
GPW-3	Dry	<0.2 U	Dry	1.15	Dry	Dry	0.276 J	0.344 J	Dry	Dry	0.311 J
HBW-1	<0.2 U	<0.2 U	Dry	<0.2 U	Dry	Dry	<0.2 U	<0.2 U	Dry	Dry	<0.2 U
HBW-7	<0.2 U	<0.2 U	Dry	0.201 J	Dry	Dry	<0.2 U	0.124 J	Dry	Dry	<0.2 U
HBW-10	<0.2 U	<0.2 U	Dry	<0.2 U	Dry	Dry	<0.2 U	<0.2 U	Dry	Dry	<0.2 U

Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
Creek Sample ID	**Feb 2016**	**May 2016**	**Aug 2016**	**Nov 2016**	**Feb 2017**	**May 2017**	**Aug 2017**	**Dec 2017**	**Mar 2018**	**Jun 2018**	**Aug 2018**
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	Dry	<2.0 U	<2.0 U	Dry	<2.0 U
GPW-3	0.474	0.457	0.141	0.563	<1 U	0.274	Dry	<2.0 U	<2.0 U	Dry	<2.0 U
HBW-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	1.1 J	<2.0 U	Dry	<2.0 U
HBW-7	<0.2 U	<0.2 U	<0.2 U	0.318 J	<1 U	0.155	<0.2 U	<2.0 U	<2.0 U	Dry	<2.0 U
HBW-10	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	0.111 J	<2.0 U	<2.0 U	Dry	<2.0 U

NS – not sampled U – non-detect J – Estimated Dry – no surface water

Quarter	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Creek Sample ID	**Oct 2018**	**Jan 2019**	**Apr 2019**	**Jul 2019**	**Oct 2019**	**Jan 2020**	**Apr 2020**	**Jul 2020**	**Dec 2020**
GPW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.163	0.0589 J	<0.05 U	0.110
GPW-3	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.156	0.0662 J	0.0326 J	0.108
HBW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.0600 J	<0.05 U	<0.05 U	0.0305 J/ 0.0374 J
HBW-7	<2.0 U	<2.0 U	<2.0 U	27 (initial)/ 1.2 J (resample)	1.6 J	0.0761 J	<0.05 U	0.0318 J	0.0265 J
HBW-10	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.0782 J	<0.05 U	<0.05 U	<0.05 U

NS – not sampled U – non-detect J – Estimated Dry – no surface water



Note: Surface water at HBW-7 had a detection of 27 µg/L from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J µg/L.

Longhorn Army Ammuntion Plant Creek Sampling Locations