Subject: Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting
Longhorn Army Ammunition Plant (LHAAP)
Location of Meeting: Karnack Community Center
Date of Meeting: November 16, 2022, 6:00 PM Central Standard Time (CST)

Meeting Participants:

Army BRAC:	Rose M. Zeiler
USACE:	Chelsea Montoya
USAEC:	Lena Sierocinski, Michael Bowlby
Bhate:	Kimberly Nemmers, Zachary Beck
APTIM:	Bill Foss
HDR, Inc.	Philip Werner, Amita Patel
MMG-TLI JV:	Jonathon Tallman (via phone)
USEPA Region 6:	Brian Follin
TCEQ:	April Palmie (via phone)
RAB:	Present: Nigel Shivers, Sharon McAvoy, Deon Hall, and Judy VanDeventer Absent: Charles Dixon, Tom Walker, John Fortune, and Richard LeTourneau
Public:	Robert Speight, Daniele Connell, Joy Young, Mike Madl (Arcadis), Dana Schmidt (Arcadis)

A color copy of the slide presentation and handouts (see list at end of meeting minutes) were provided for meeting attendees.

Welcome and Introduction

Ms. Judy VanDeventer welcomed everyone to the RAB Meeting and called the meeting to order, which Mr. Deon Hall seconded. New attendees introduced themselves. Ms. Rose Zeiler introduced the contractors presenting at the RAB including Bhate Environmental Associates, Inc. (Bhate); APTIM Federal Services (APTIM); MMG-TLI Joint Venture; and HDR, Inc. (HDR). Mr. Mike Madl and Ms. Dana Schmidt were then introduced, by Ms. Zeiler, as the contractors selected to complete the Preliminary Assessment for per- and polyfluoroalkyl substances (PFAS), which is an emerging contaminant. Ms. VanDeventer asked where the PFAS might be present. Mr. Michael Bowlby stated that the PFAS is typically associated with fire fighting foam so the areas where the foam may have been used, disposed, or stored are the primary focus. Chrome plating is another area where PFAS products may have been used so those areas are also evaluated. Ms. Schmidt discussed the Preliminary Assessment and Site Assessment process including review of historical documents, use of areas (e.g., fire stations) and collection of soil and groundwater samples for analysis. Ms. Schmidt said that a report will then be prepared with the analytical results from the samples in addition to the other data gathered. Ms. Zeiler said that the information will be used to determine if PFAS is an issue at LHAAP. Ms.

VanDeventer asked if the Fire Station was the only site being assessed. Ms. Schmidt mentioned some of the other areas being assessed but clarified that the Powerhouse (a building at LHAAP [Building 401], located northwest of and adjacent to LHAAP-04) was not identified as a possible PFAS site. Ms. Zeiler said that if PFAS is detected then additional investigation and assessment will be considered for the next phase of the process. Mr. Brian Follin then explained that the investigation of PFAS is following the same process used at other federal facilities. Mr. Bowlby explained that active and inactive Army installations across the U.S. are undergoing the same assessment to assess whether PFAS is present, and, if so, to conduct additional investigation.

Membership Update

Ms. Zeiler, with Army Base Realignment and Closure (BRAC), asked if there were any members of the public interested in joining the RAB. She provided an overview of the membership process, stating that anyone in the public can become a RAB member. Ms. Zeiler further explained that there is an application available on the public website for LHAAP. Ms. VanDeventer stated that she had a couple of people who may be interested in becoming a RAB member. Ms. Zeiler encouraged participation of the public attending the RAB regardless of whether they are part of the board. She explained that the RAB meets three times a year.

Minutes (June 2022 RAB Meeting)

Ms. Zeiler verified that there were no comments or changes to the June meeting minutes. Motion to approve the June 2022 RAB meeting minutes was provided by Ms. VanDeventer with Mr. Hall seconding the motion.

Documents in Progress

Ms. Kimberly Nemmers, with Bhate Environmental Associates, Inc. (Bhate), introduced the three contractors performing work at LHAAP. She explained which sites each of the contractors are managing. Ms. Nemmers explained that work at LHAAP-18/24, which Bhate oversees as an interim remedy, overlaps with HDR, Inc., who is developing the final remedial design.

Ms. Nemmers then presented the documents and field work completed in the past 3 months. She explained that Remedial Action-Operation (RA-O) is the performance groundwater monitoring at LHAAP. Sites with RA-O have remedies in place, such that the groundwater monitoring is completed to evaluate those remedies. An annual report is then produced to document the monitoring. Ms. Nemmers then explained that the next 3 months included continued groundwater monitoring to ensure compliance at the sites within the Bhate contract.

LHAAP-04

Mr. Bill Foss, with APTIM Federal Services, presented the remedial design (RD) implemented at LHAAP-04. He explained the history of the site, the remedy implementation, and the ongoing sampling performance. Mr. Foss explained that the site was in Year 4 of RA-O sampling. Prior to the implementation of the RD, he specified that perchlorate had been detected at greater than 5 times the established protective concentration limit. Mr. Foss explained that monitoring wells, which never had contamination, are no longer sampled. He also pointed out that total organic

carbon is no longer analyzed for the groundwater. However, Mr. Foss said that field parameters such as oxidation reduction potential are still collected for the site. He further explained that reducing conditions had recently been observed again, but the lack of rainfall in 2022 may have been a contributing factor. Mr. Foss stated that six monitoring wells within the former perchlorate plume area and one downgradient monitoring well will continue to be sampled on a semiannual basis.

Groundwater Treatment Plant (GWTP) Update

Ms. Nemmers provided an overview of the GWTP, which currently treats groundwater from LHAAP-18/24 and recently started processing groundwater from LHAAP-17. She presented a handout depicting a graph of the amount of treated groundwater discharged each month. She explained that the amount of treated groundwater varies based on rainfall and where the groundwater can be discharged.

Surface Water

Ms. Nemmers said that the surface water is sampled quarterly, but there was no surface water flow in the Bayou during the third quarter such that samples could not be collected. She pointed everyone to the handout for the surface water sampling with the surface water results to date.

LHAAP-18/24

Ms. Amita Patel with HDR, Inc., presented the RD for Longhorn Site LHAAP-18/24. She explained that additional investigation had been completed to support the RD. Ms. Patel outlined the selected remedy which includes enhancement of the existing groundwater extraction and treatment system, enhanced in-situ bioremediation (EISB), thermal treatment to remove dense non-aqueous phase liquid (DNAPL), maintenance of the existing cap over the Unlined Evaporation Pond, unsaturated soil excavation and off-site disposal, land use controls (LUCs), monitored natural attenuation (MNA), and long-term monitoring (LTM).

Ms. Patel explained that the remedy will be implemented in a phased approach. The first phase will include soil excavation and disposal from three different areas (approximately 4,000 cubic yards) to remove the source areas with elevated concentrations that may act as a continual source of contamination to the groundwater. She stated that the shallow aquifer zone is observed to have clay, silt, and sands with DNAPL in the soils within the containment area. The DNAPL will be removed using in situ thermal desorption (ISTD) treatment that warms up the ground with an extraction system to remove the contaminated vapor from the soil. She also described the three pilot tests planned to evaluate in situ bioremediation. Based on the pilot tests, bioremediation of the groundwater will be implemented. Two pilot tests will involve injection in a grid formation like what was used at LHAAP-04. The one pilot test will be in biobarrier wall configuration, which she explained provides treatment as groundwater passes through. Ms. Patel said that the remedy developed is an aggressive approach with treatment within the containment and also outside of the containment area. She said that the EISB implementation is the second phase and includes about 4,000 linear feet of shallow zone biobarriers and 1700 liner feet of deeper Wilcox Formation biobarriers. She also mentioned that

with the treatment of 60 to 70-percent of the onsite area in the grid formation, the GWTP will be shut down as part of the third phase. Ms. VanDeventer asked about replacement of the GWTP. Ms. Patel said that the once the groundwater monitoring phase is started after the RD is implemented, the GWTP will no longer be required. Ms. Zeiler clarified that the completed phases of the remedy will allow us to shutdown the GWTP, but that groundwater monitoring will continue to ensure the remedy is protective.

LHAAP-29

Ms. Patel discussed the RD for LHAAP-29, which includes many of the same remediation technologies as LHAAP-18/24. She explained that the selected remedy for LHAAP 29 also includes removal and off-site disposal of contaminated soil, flushing, inspection, and plugging of the transite trinitrotoluene (TNT) wastewater line and the vitrified clay cooling water lines, and excavation and off-site disposal of the wooden TNT wastewater line and associated impacted soil. Soil sampling will be completed under the removed lines to ensure no contamination has left behind. ISTD of the intermediate groundwater zone to remove DNAPL will then be implemented, followed by MNA in the shallow groundwater zone and for the intermediate groundwater zones. When asked by Ms. Zeiler about any questions related to the treatment technologies, no questions were requested.

LHAAP-47

Mr. Philip Werner, with HDR, Inc., stated that the Final Record of Decision (ROD) was placed in the Administrative Record (AR) in August 2022. He also stated that LUC notifications were sent via a letter to required State and local representatives and that the ROD notice was published in both the Shreveport Times and Marshall News Messenger. Mr. Werner explained that LUC notification was also sent to the Texas Department of Licensing and Regulations (TDLR) to provide the groundwater use restrictions to drillers.

Referring to the LHAAP-47 Responsiveness Summary handout, Mr. Werner explained that public comments to the Proposed Plan were reviewed and compiled into categories. The Proposed Plan was finalized for LHAAP-47 in December 2012 and then revised and again finalized in June 2021. Mr. Werner then detailed the purpose of the Responsiveness Summary, which is to hear community concerns about the preferred alternative at LHAAP-47, demonstrate how the public's input is considered in the selection of the remedy, and provide a formal mechanism for a response to public comments.

Mr. Werner then discussed the development of comment categories based on the public input. The comment categories included the use of thermal treatment technology, metals, and the need to develop a quantifiable criterion to address cleanup of metals and perchlorate in groundwater. Additional comment categories included surface water modeling, time to complete cleanup, natural attenuation, and estimation of hydraulic conductivity. He explained that the public comments have resulted in the pre-design investigation now including a pump test (instead of a slug test) to better determine conductivity as well as updating the surface water model. The Responsiveness Summary incorporates both 2013 and 2021 public meeting comments.

Mr. Werner presented the LUCs that are being implemented under the ROD along with the LUC boundary. He explained that groundwater use will be prohibited with the exception of environmental monitoring. He said that the land cannot be used for residential purposes. He also stated that the integrity of all current or future remedial or monitoring systems must be maintained, such as the ISTD treatment system. Mr. Werner explained that ISTD treatment was evaluated for several of the remedial alternatives at LHAAP-47.

Mr. Werner asked for comments on the Responsiveness Summary, but none were provided. He then asked RAB members and the public to think about the Responsiveness Summary and to e-mail Ms. Zeiler with any comments or input.

LHAAP-17

Mr. Jonathon Tallman, with MMG-TLI Joint Venture, discussed the Time Critical Removal Action (TCRA) completed at LHAAP-17. He outlined the major work elements and 96 munitions and explosives of concern (MEC) items were disposed through on-site detonations. Mr. Tallman explained that there were over 400 targets identified with soil being sifted and soil being disposed off-site. He stated confirmation samples were collected following excavations, but additional removal action is likely to be required at the site.

Ms. Nemmers then presented the groundwater extraction system installed at LHAAP-17 in August 2022. She stated that the system pumps water to a 2,500-gallon tank that then discharges to a pipe along the road. The water treatment system piping then ties into the water piping system from LHAAP-18/24 for treatment at the GWTP. She explained that a radio controller transmits the volume information to the GWTP via the existing programmable logic control (PLC) system. Ms. Nemmers said that the system is currently pumping about 1,500 gallons per day to the GWTP. She said that the perchlorate in the influent to the GWTP has increased significantly. Ms. Nemmers explained that the extraction system is clearly pulling water to the extraction wells as observed by the decrease in perchlorate concentrations in the monitoring wells at the edge of the plume. The concentration of perchlorate detected in groundwater from one of the extraction wells (17WW06) has increased. She then explained that this change in concentration in 17WW06 is typical of extraction systems and will eventually hit a tipping point and decrease, which is the goal of the system. She then showed a map of how the system is laid out.

Metals Discussion

Ms. Zeiler explained that the metals discussion was postponed until the next RAB meeting to allow more time for the Army's review of documents. Ms. Zeiler said that groundwater remedies are evaluated via a Five-Year Review (FYR) to determine if the remedies are protective of human health and the environment. That includes a review of metals data collected from groundwater during the previous 5 years where required by the ROD. Ms. VanDeventer asked if the recommendations would be presented at a future RAB meeting and for details on the distribution of the FYR. Ms. Zeiler said the FYR is posted to the AR and the recommendations are reviewed and implemented, as appropriate, at the sites. She gave examples of these implementations at various sites that included installation of wells and EISB, including LHAAP-12, LHAAP-37, LHAAP-67, and LHAAP-58. Mr. Foss pointed out that a round of metals sampling was just performed at

LHAAP-16 in support of the upcoming FYR. Ms. Zeiler concurred and indicated that the data evaluated in the FYR includes past and present data.

Transfer Update

Ms. Zeiler discussed that LHAAP-03, LHAAP-37, LHAAP-46, and LHAAP-50 are planned for transfer from the Army to the United States Fish and Wildlife Service, in addition to the old Oil and Gas Pad. She said that these sites/areas account for approximately 171 acres. With the exception of the Oil and Gas Pad, each of the sites has a groundwater plume.

Next RAB Meeting Schedule and Closing Remarks

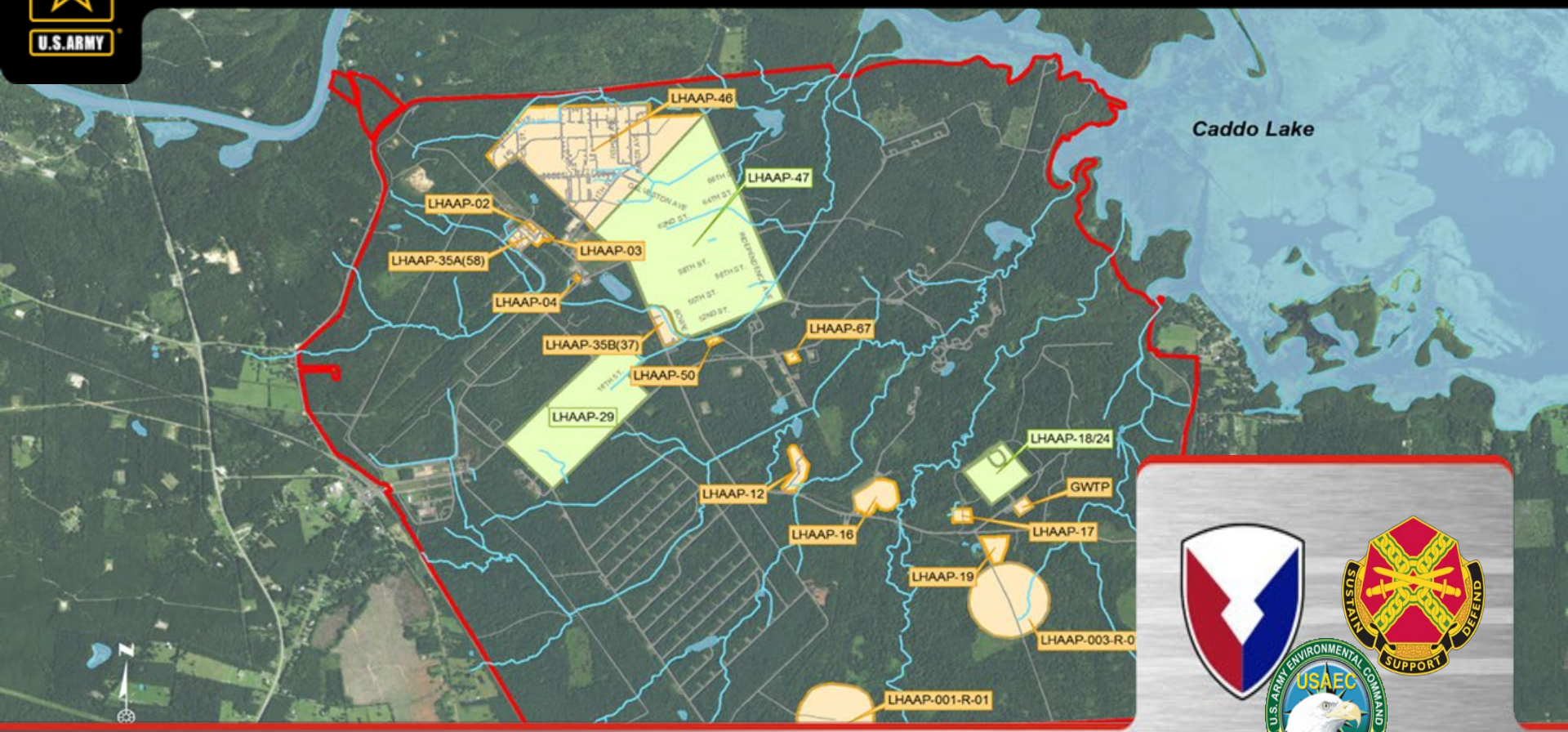
Ms. Zeiler stated that the FYR requires a site inspection, in which the attendance of the regulatory personnel is strongly encouraged. Since this inspection must be completed in early 2023, she asked if the RAB meeting could be scheduled 1 week earlier allowing the RAB and the FYR site inspections to be completed during the same site visit. Ms. Zeiler said that the next RAB meeting was proposed for February 8, 2023, which will still occur on a Wednesday. There were no objections from RAB members regarding the proposed RAB meeting date. Ms. Zeiler stated that the RAB will be informed of the RAB meeting date – whether the 8th or the 15th – when a final decision has been made.

Adjourn

Mr. Hall made a motion to adjourn, which was seconded by Ms. VanDeventer. The meeting adjourned at 7:07 pm CST.

November 2022 Meeting Attachments and Handouts:

- Color copy of Bhate presentation slides
- GWTP – Processed Groundwater Volumes Handout
- Surface Water Sampling Handout
- LHAAP-47 Responsiveness Summary



Longhorn Army Ammunition Plant (LHAAP) Quarterly Restoration Advisory Board Meeting

16 November 2022

US Army Environmental Command (USAEC)

Abbreviations and Acronyms

#	Number
µg/L	Micrograms per liter
bgs	Below ground surface
DERP	Defense Environmental Restoration Program
DNAPL	Dense Non-aqueous Phase Liquid
EISB	Enhanced In-Situ Bioremediation
EPA	Environmental Protection Agency
GPW	Goose Prairie Creek Water Sample
GWP-Res	Residential Groundwater Use Protection
GWTP	Groundwater Treatment Plant
HBW	Harrison Bayou Water Sample
ISB	In-Situ Bioremediation
ISTD	In-Situ Thermal Desorption
J	Estimated laboratory value
LHAAP	Longhorn Army Ammunition Plant
LTM	Long term monitoring
LUCs	Land Use Controls
MC	Methylene Chloride
MEC	Munitions and explosives of concern
mg/L	Milligrams per liter
MNA	Monitored Natural Attenuation
MSC	Medium-Specific Concentration
mV	millivolts
NV	No value
PCL	Protective Concentration Level
PLC	Programmable logic control
RAB	Restoration Advisory Board
PDI	Pre-Design Investigation
RA(O)	Remedial Action Operation
ROD	Record of Decision
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TNT	Trinitrotoluene
TOI	Target of Interest
TRRP	Texas Risk Reduction Program
TTT	Thermal Treatment Technology
UEP	Unlined Evaporative Pond

AGENDA – November 16, 2022 at 6 p.m.

- 6:00 - Welcome and Introduction
- 6:05 - Open Items
  - Ongoing Outreach/Website
  - Restoration Advisory Board (RAB) Administrative Issues
    a) Membership Update
    b) Minutes (June 2022 RAB Meeting)
- 6:10 - Community Involvement Plan Update
- 6:20 - Defense Environmental Restoration Program (DERP) Update
  - Documents and Field Work Completed since last RAB
  - Three Month Look ahead
  - LHAAP-04
  - Groundwater Treatment Plant Update
- 6:30 - Other DERP Update
  - LHAAP-18/24, -29, and -47 Status
  - LHAAP-47 Responsiveness summary for LHAAP-47
  - LHAAP-17 Status
- 6:45 - Metals discussion
- 6:50 - Transfer Update
- 6:55 - Next RAB Meeting Schedule and Closing Remarks

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 the Longhorn Army Ammunition Plant (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
- There are three contractors working at LHAAP: Bhate/APTIM; HDR, Inc.; and MMG-TLI Joint Venture. The work conducted by these contractors will be presented in the following slides in that order.

Administrative Issues

- Restoration Advisory Board (RAB) Membership Update
    - Persons interested in being new members
- Minutes (June 2022 RAB Meeting)

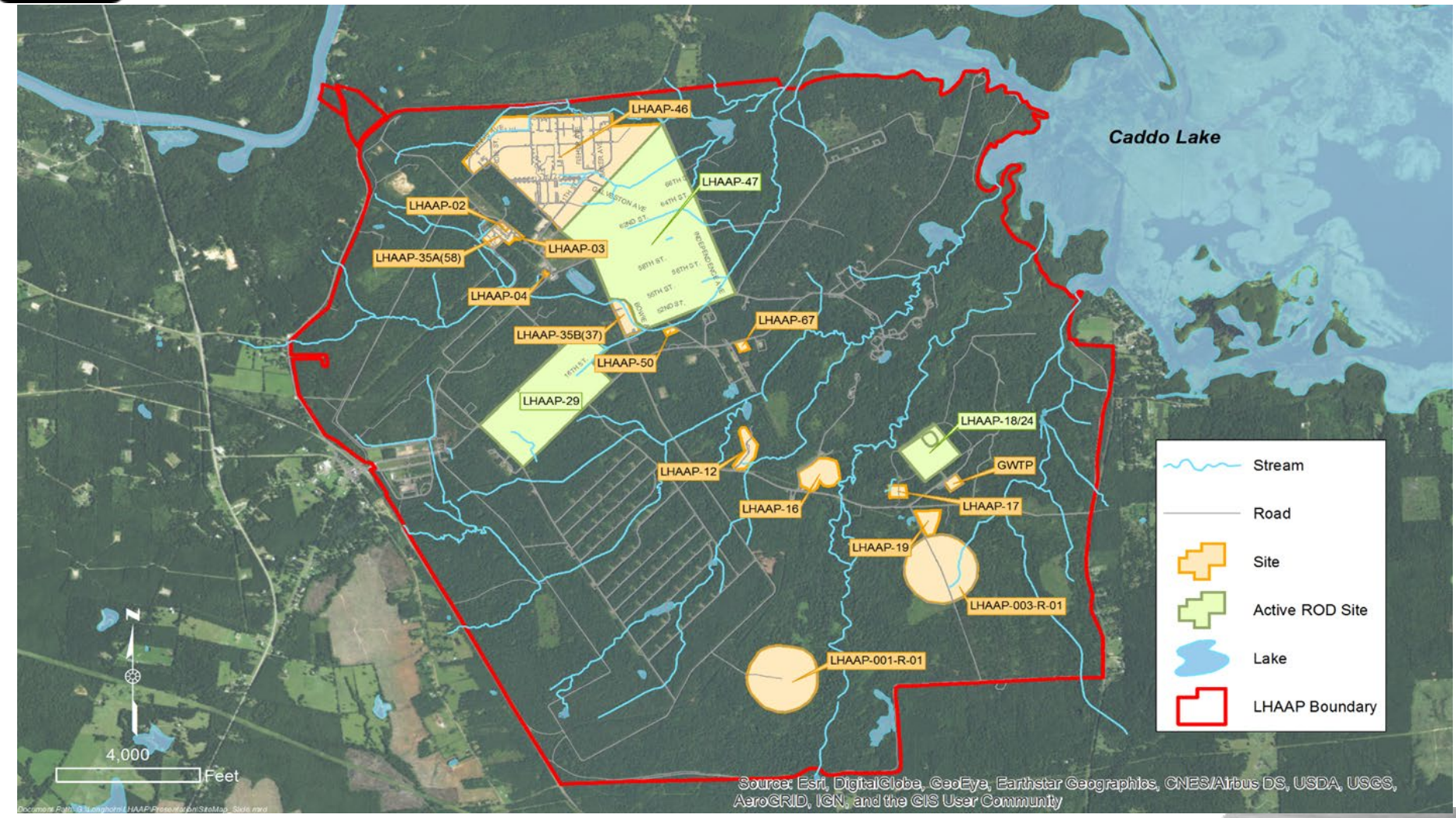
Community Involvement

- Community Involvement Plan Update

LHAAP Environmental Contractors

- Bhate/APTIM: LHAAP-02, -03, -04, -12, -16, -37, -46, -50, -58, -67, -001-R-01, -001-R-03, and -18/24 (interim remedy)
- HDR: LHAAP-18/24, -29, and -47
- MMG-TLI Joint Venture: LHAAP-17

Bhate/APTIM


LHAAP-46
LHAAP-47
LHAAP-02
LHAAP-03
LHAAP-35A(58)
LHAAP-04
LHAAP-35B(37)
LHAAP-50
LHAAP-29
LHAAP-67
LHAAP-18/24
GWTP
LHAAP-12
LHAAP-16
LHAAP-17
LHAAP-19
LHAAP-003-R-01
LHAAP-001-R-01
Caddo Lake
Stream
Road
Site
Active ROD Site
Lake
LHAAP Boundary
4,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Document in Progress

- LHAAP-04: Year 3 Annual Remedial Action Operation (RA[O]) Report – In Progress
- LHAAP-16: Year 2 Annual RA(O) Report – In Regulatory Review
- LHAAP-37: Year 5 Annual RA(O) Report – In Progress
- LHAAP-46: Year 8 Annual RA(O) Report – In Progress
- LHAAP-50: Year 8 Annual RA(O) Report – In Regulatory Review
- LHAAP-58: Year 8 Annual RA(O) Report – In Progress
- Groundwater Treatment Plant (GWTP): Quarterly Evaluation Report: 2nd Quarter (April – June 2022) – In Regulatory Review
- GWTP: Quarterly Evaluation Report: 3rd Quarter (July-September 2022) – In Progress

Completed Field Work Since Last RAB Meeting

- LHAAP-04: Year 3 Semi-Annual Sampling Event #2 (August 2022)
- LHAAP-16: Year 3 Semi-Annual Sampling Event #1 (June/July 2022)
- LHAAP-50: Year 3 First Semiannual Remedial Action Operation (RA[O]) Sampling (October 2022)
- LHAAP-58: Semi-annual RA(O) Sampling (June 2022)
- LHAAP-18/24: Semi-annual RA(O) Sampling (August 2022)
- Surface Water: 3rd Quarter Sampling (August 2022)

3 Month Look Ahead-Documents by Bhate Team

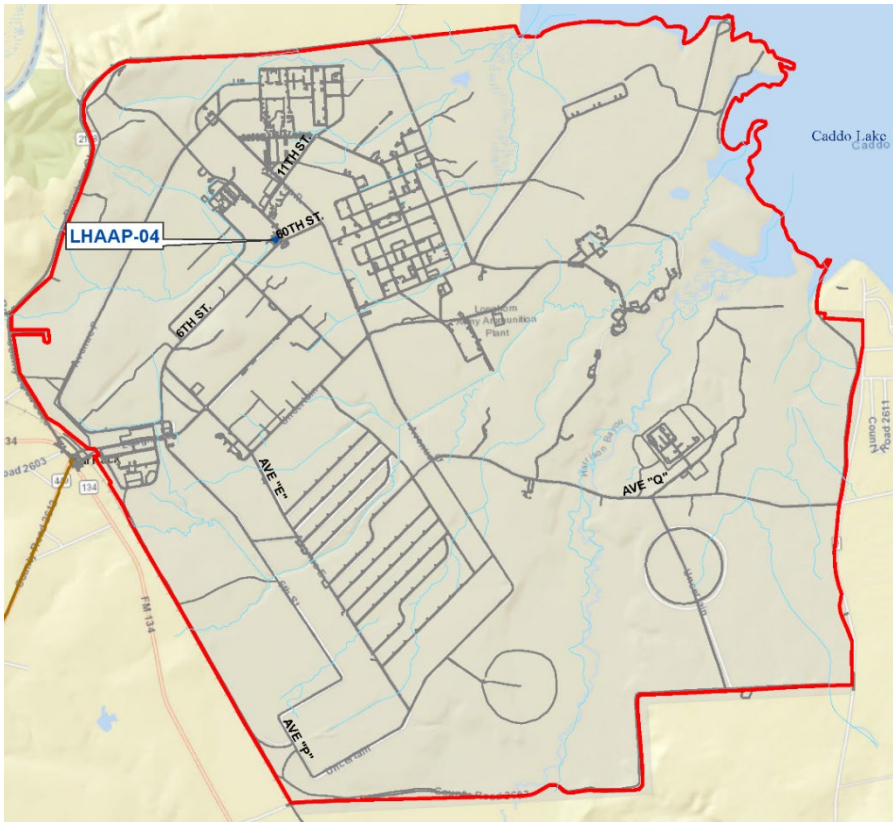
- LHAAP-04: Draft Remedial Action Operation (RA[O]) Report to Regulators
- LHAAP-37: Draft Year 5 RA(O) Report to Regulators
- LHAAP-46: Draft Year 8 RA(O) Report to Regulators
- LHAAP-50: Draft Final Year 8 RA(O) Report to Regulators
- LHAAP-58: Draft Final Year 8 RA(O) Report to Regulators
- Groundwater Treatment Plant (GWTP) and LHAAP-18/24: Quarterly Evaluation Report 3rd Quarter (July – September 2022) to Regulators

3 Month Look Ahead-Field Work by Bhate Team

- LHAAP-12: 2022 Annual Sampling (December 2022)
- LHAAP-16: Year 3 Semi-Annual Sampling Event #2 (January 2023)
- LHAAP-37: Year 6 Annual Sampling (November 2022)
- LHAAP-58: Year 8 Semi-Annual Sampling Event #2 (December 2022)
- LHAAP-67: Year 9 Annual Sampling (November 2022)
- LHAAP-18/24: Semi-annual Groundwater Sampling (December 2022)
- Surface Water: Fourth Quarter Sampling (October - December 2022 depending on rainfall)

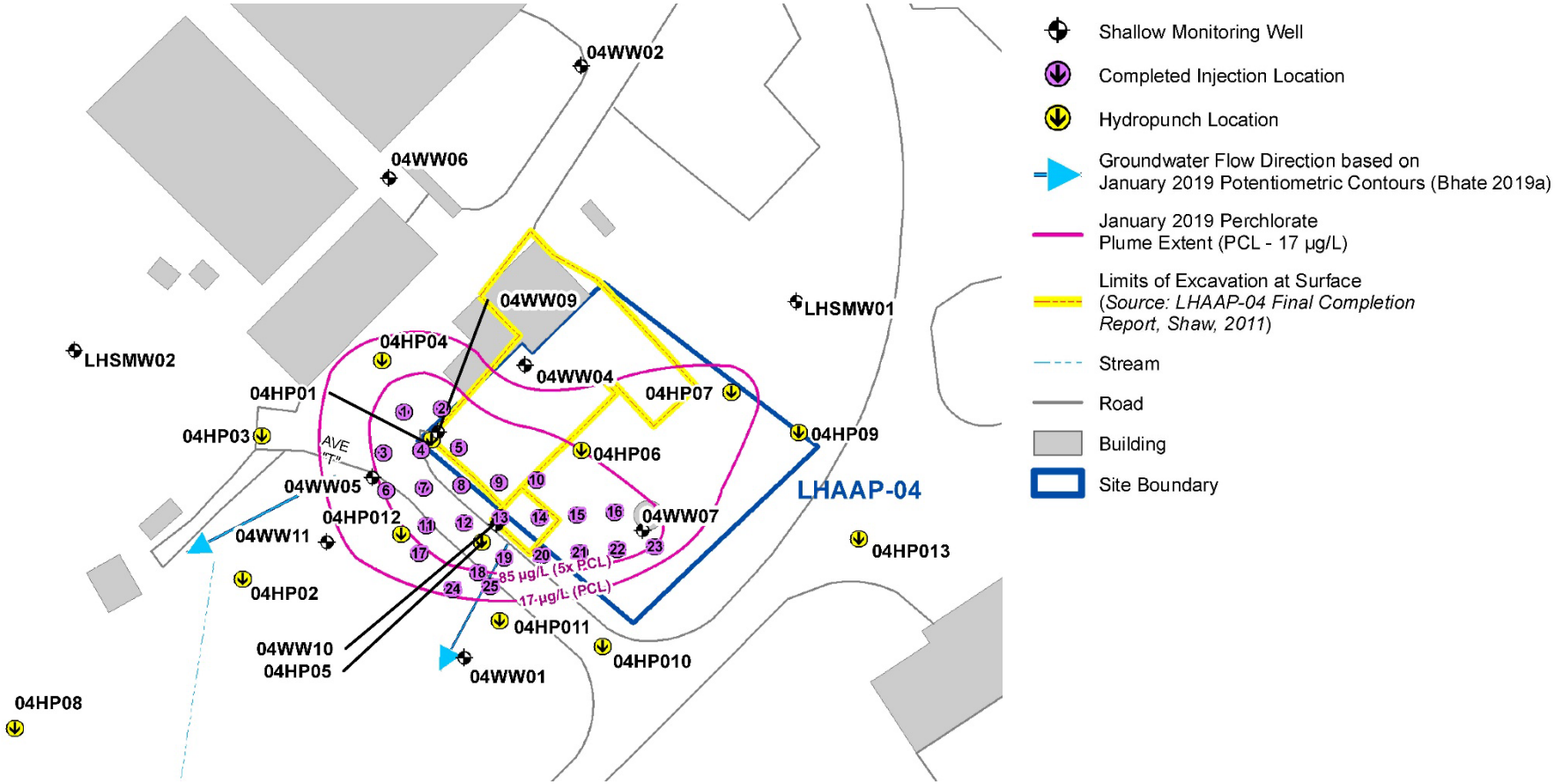
LHAAP-04 Update

- Former Pilot Wastewater Treatment Plant, located near the former Fire Station
- Demolition of structures and disposal of associated wastes in 1997
- Soil contaminated with mercury and perchlorate excavated in 2009
- In-Situ Bioremediation (ISB) and Land Use Controls (LUCs) implemented for groundwater in November 2019
- Quarterly sampling for two years beginning in February 2020
- Monitoring network revised July 2022 for semiannual sampling



LHAAP-04 Update

- 2019 Plume and Injection Locations



LHAAP-04 Update

Location Code			04WW01										
Sample Date			1/22/2019	2/4/2020	5/4/2020	8/10/2020	11/4/2020	3/10/2021	5/24/2021	8/4/2021	11/4/2021	2/1/2022	8/2/2022
Analyte	Units	PCL	Result	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	< 0.05	< 0.05	< 0.5	< 0.2	< 0.2	< 0.05
Field Parameters													
Dissolved Oxygen	mg/L	NV	0.15	0.03	0.04	0.05	0.03	0.02	0.03	0.41	0.38	0.65	0.03
Oxidation-Reduction Potential	mV	NV	327	-52	-135	-191	-115	-219	-152	-100	-50	52	-104

Location Code			04WW07										
Sample Date			1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/11/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022
Analyte	Units	PCL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perchlorate													
Perchlorate	µg/L	17	110	86	3.51	0.557 J	< 0.05	0.169	< 0.05	< 0.5	< 0.2	< 0.2	< 0.05
Field Parameters													
Dissolved Oxygen	mg/L	NV	1.83	0.05	2.12	0.04	0.03	0.04	0.02	0.46	3.46	0.67	0.31
Oxidation-Reduction Potential	mV	NV	338	-260	-314	-112	-105	-436	-311	-158	-34	150	-148

Location Code			04WW10										
Sample Date			1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/11/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022
Analyte	Units	PCL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perchlorate													
Perchlorate	µg/L	17	10,000	< 2	< 0.05	0.339 J+	0.0888 J	< 0.05	< 0.05	< 0.05	< 0.2	< 0.2	< 0.05
Field Parameters													
Dissolved Oxygen	mg/L	NV	3.59	5.54	2.72	1.03	0.11	0.04	0.15	0.7	1.64	0.63	0.47
Oxidation-Reduction Potential	mV	NV	333	-79	-286	-47	-62	-159	-77	-38	-35	68	-24

LHAAP-04 Update

Location Code			04WW05									
Sample Date			1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/10/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022
Analyte	Units	PCL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perchlorate													
Perchlorate	µg/L	17	**78**	< 2	< 0.05	0.399 J	< 0.05	< 0.05	< 0.05	< 0.5	< 0.2	0.28	< 0.05
Field Parameters													
Dissolved Oxygen	mg/L	NV	1.62	0.09	0.22	0.14	0.15	0.08	0.08	0.48	0.52	0.76	0.1
Oxidation-Reduction Potential	mV	NV	163	-88	-90	-66	-36	-320	-60	-16	-4	127	-70

Location Code			04WW09									
Sample Date			1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/11/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022
Analyte	Units	PCL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perchlorate													
Perchlorate	µg/L	17	**2,100**	**18**	11.1	3.92	2.02	< 0.05	< 0.5	< 0.5	< 0.2	< 1	< 0.05
Field Parameters													
Dissolved Oxygen	mg/L	NV	5.78	0.08	0.04	0.03	0.02	0.09	0.04	0.33	0.22	0.43	0.13
Oxidation-Reduction Potential	mV	NV	326	-74	-16	-87	-91	-21	-246	-127	-85	23	-134

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.

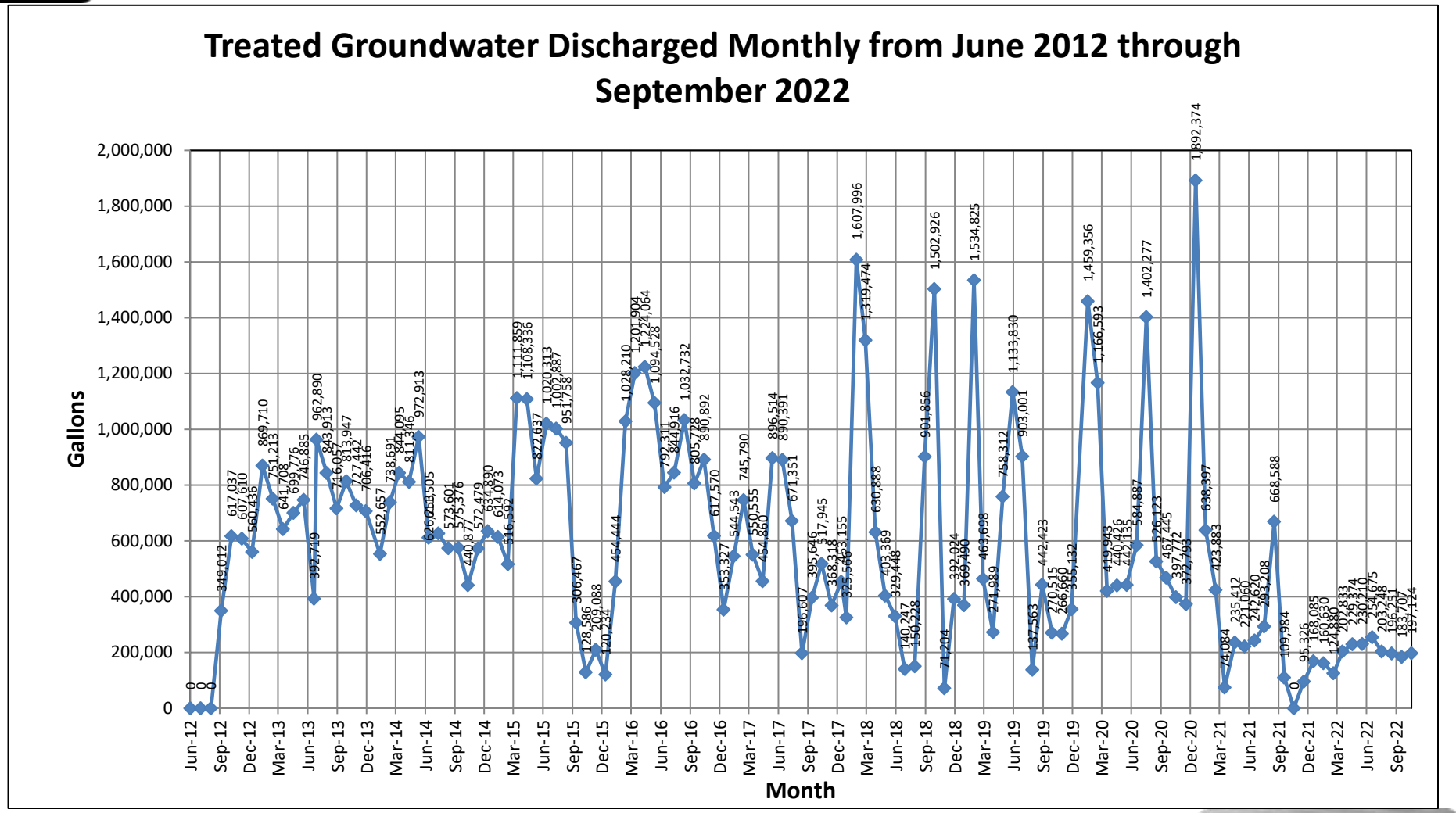
PCL - Texas Risk Reduction Program Tier 1 Groundwater Residential Protective Concentration Level.

mV - millivolts

LHAAP-04 Update

- Perchlorate has remained below the cleanup goal for nine consecutive sampling events since February 2020
- Dissolved Oxygen and Oxidation Reduction Potential were increasing over time prior to the August 2022 sampling event, when these field screening parameters were observed to have decreased
- Reduction of sampling network approved by Regulators in July 2022
- Semi-annual sampling will continue at six formerly contaminated monitoring wells and one downgradient location
- Laboratory analysis for perchlorate and geochemical parameters as field measurements

GWTP Update


Treated Groundwater Discharged Monthly from June 2012 through September 2022
Gallons
Month
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jun-12
Sep-12
Dec-12
Mar-13
Jun-13
Sep-13
Dec-13
Mar-14
Jun-14
Sep-14
Dec-14
Mar-15
Jun-15
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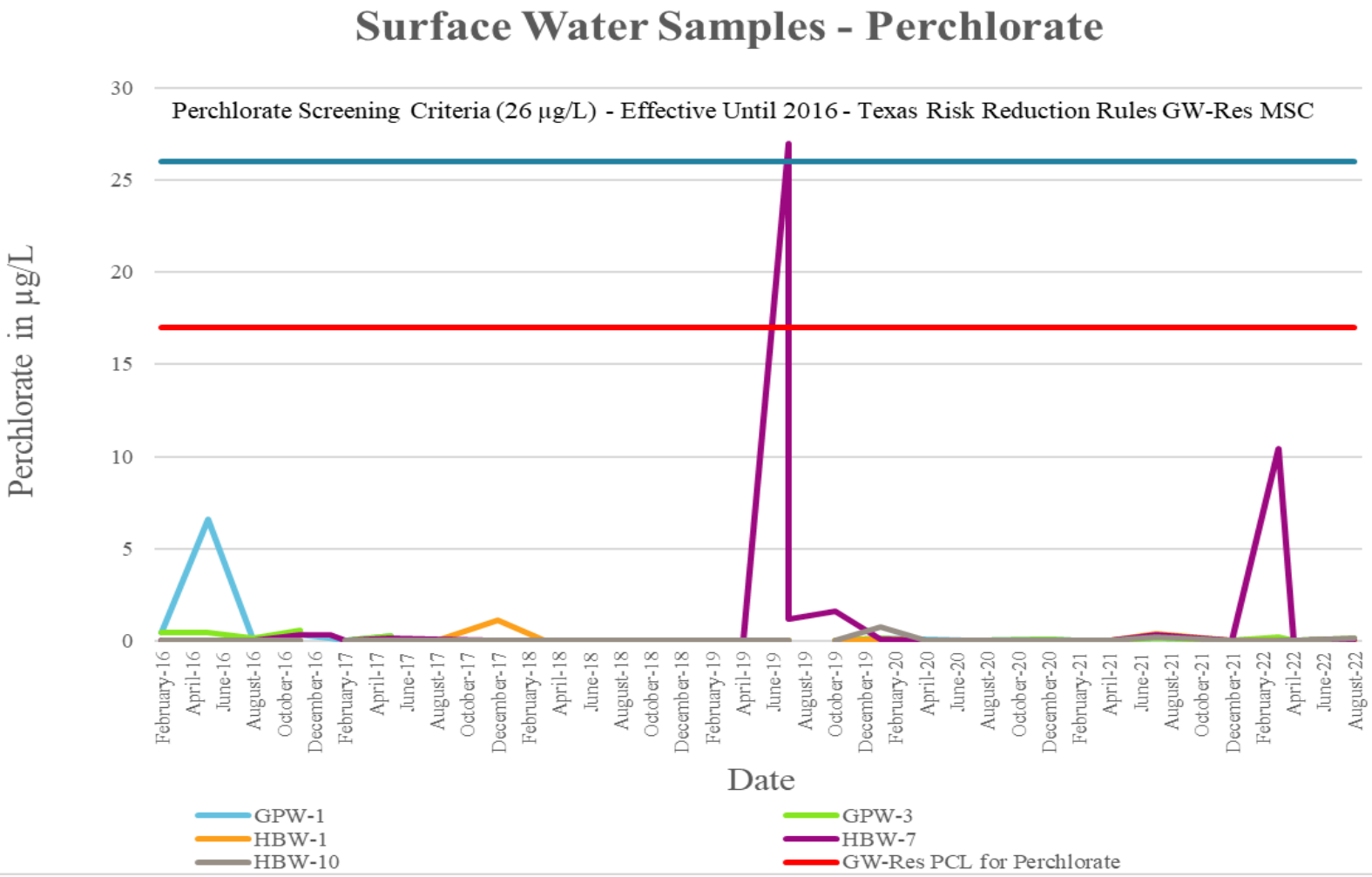
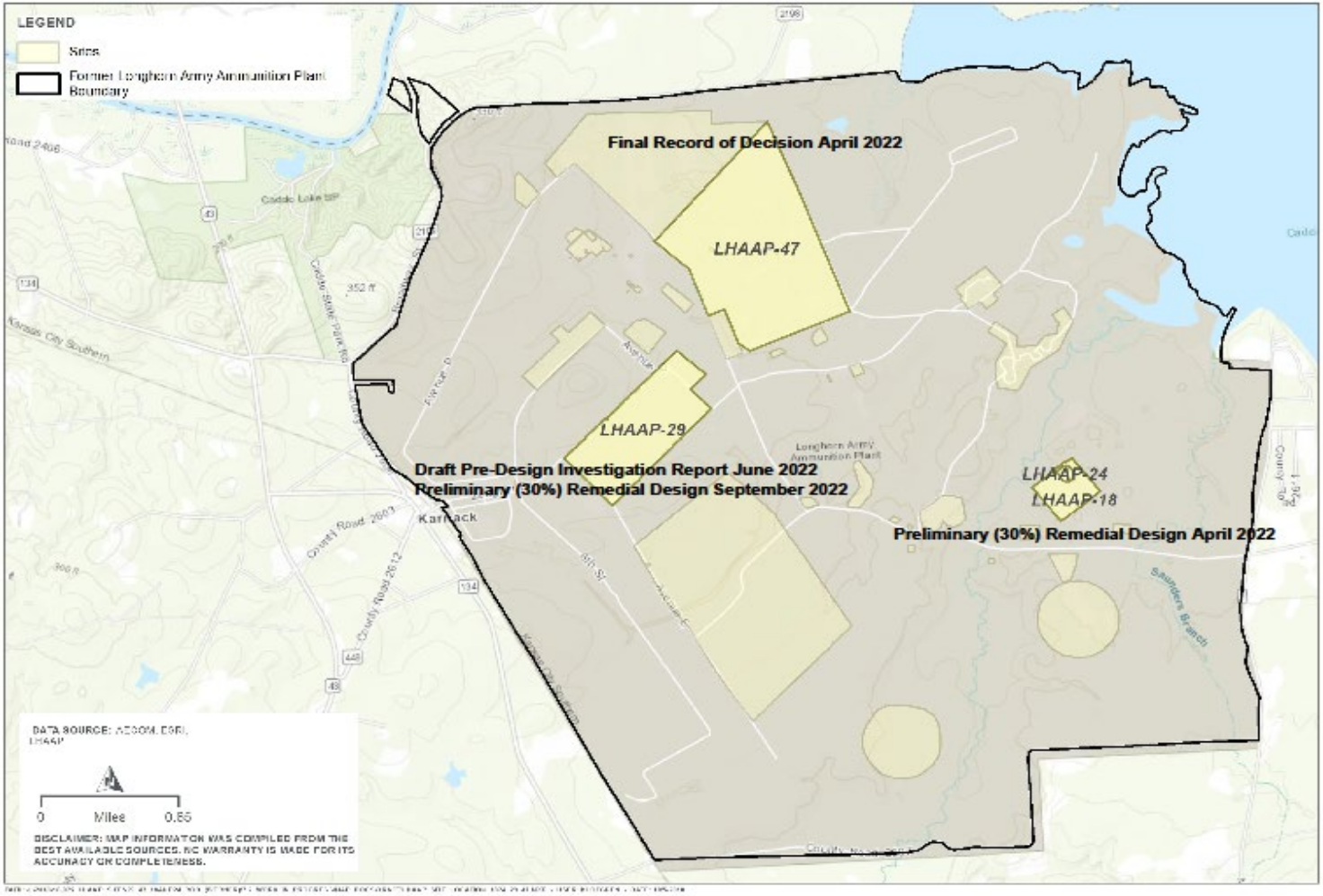
Mar-22
Jun-22
Sep-22

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.

HDR Update


LEGEND
Sites
Former Longhorn Army Ammunition Plant Boundary
Final Record of Decision April 2022
LHAAP-47
LHAAP-29
Draft Pre-Design Investigation Report June 2022
Preliminary (30%) Remedial Design September 2022
LHAAP-24
LHAAP-18
Preliminary (30%) Remedial Design April 2022
Karnack
Caddo Lake SP
Longhorn Army Ammunition Plant
Saunders Branch
0
Miles
0.65
DISCLAIMER: MAP INFORMATION WAS COMPILED FROM THE BEST AVAILABLE SOURCES. NO WARRANTY IS MADE FOR ITS ACCURACY OR COMPLETENESS.

LHAAP-18/24, -29, and -47 Document Status, HDR

- LHAAP-18/24: Draft Intermediate (60%) Remedial Design submitted August 2022
- LHAAP-29: Draft Final Pre-Design Investigation (PDI) Report submitted September 2022
- LHAAP-29: Draft Preliminary (30%) Remedial Design submitted July 2022
- LHAAP-47: Final Record of Decision (ROD) Submitted to Administrative Record August 2022

LHAAP-18/24 Preliminary (60%) Remedial Design

Selected Remedy

- Enhancement of the existing groundwater extraction and treatment system
- Enhanced In-Situ Bioremediation (EISB) in Shallow Zone and Wilcox Formation groundwater both inside and outside the containment area
- Thermal treatment to remove Dense Non-aqueous Phase Liquid (DNAPL)
- Maintenance of the existing cap over the Unlined Evaporative Pond (UEP)
- Unsaturated soil excavation and off-site disposal
- LUCs, Monitored Natural Attenuation (MNA), and long-term monitoring (LTM)

Design Approach

Phase I:

- Soil Excavation
- In-Situ Thermal Desorption (ISTD) to remove DNAPL
- Implementation of three EISB field pilot tests

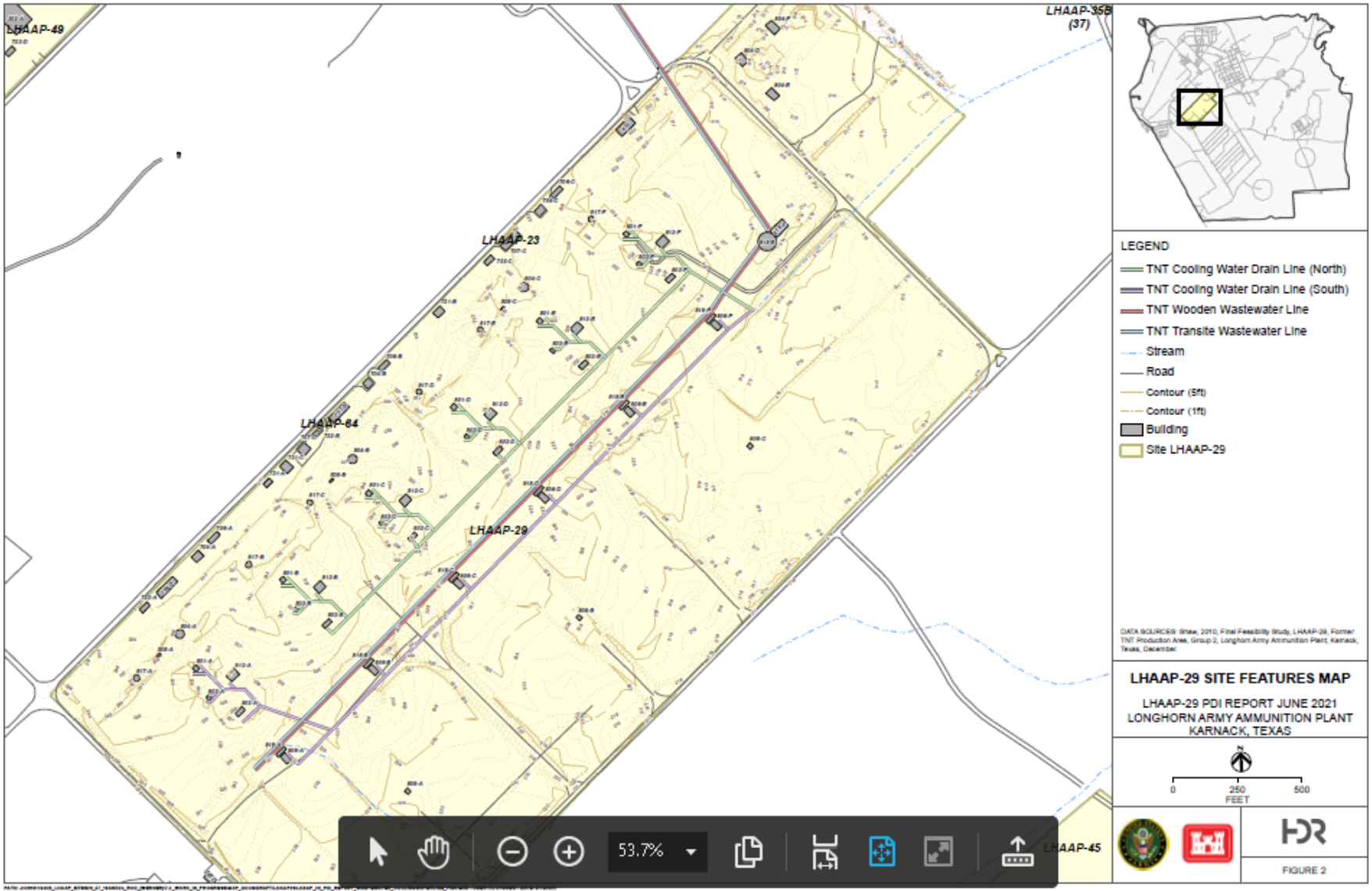
Phase II:

- EISB within ISTD areas
- EISB in most contaminated portion of source areas (Shallow & Wilcox)
- EISB Barrier Wall in the Shallow Zone & Wilcox Formation

Phase III:

- Phased Shut down of GWTP
- MNA

Site Map LHAAP-29



Status of LHAAP-29 PDI Reporting

- Draft Final Pre-Design Investigation (PDI) Report submitted to Regulators September 2022.
- Final PDI Report to be submitted November 2022.
- Second round of PDI field investigation performed March 2022 to fill data gaps identified during initial investigation.
- Areas of investigation:
    - Former Building 812-F
    - Cooling Water Outfall/Ditch
    - North trinitrotoluene (TNT) Cooling Water Line
    - South TNT Cooling Water Line
    - Transite TNT Wastewater Line
- Total of 87 boreholes advanced across LHAAP-29, collection of 98 soil samples for explosives testing.

LHAAP-29 Draft Intermediate (60%) Remedial Design

- LHAAP-29 Draft Intermediate (60%) Remedial Design
- Selected Remedy:
  - Contaminated soil removal with off-site disposal.
  - Flushing, inspection, and plugging of the transite trinitrotoluene (TNT) wastewater line and the vitrified clay cooling water lines.
  - Excavation and off-site disposal of the wooden TNT wastewater line and impacted soil.
  - In-Situ Thermal Desorption (ISTD) treatment of the intermediate groundwater zone Dense Non-aqueous Phase Liquid plume
  - Monitored Natural Attenuation in the shallow groundwater zone plumes and for the intermediate groundwater plume following ISTD.
  - Land Use Controls for soil and groundwater.

LHAAP-47 Record of Decision

- Final LHAAP-47 Record of Decision placed in Administrative Record August 2022.
- Notification Letters sent August 2022.
- LUC Notifications to Texas Department of Licensing and Regulation submitted August 2022.
- Media Release Notice of Availability of the Final Record of Decision for LHAAP-47 in Shreveport Times and Marshall News Messenger, September 2022.

LHAAP-47 Record of Decision Responsiveness Summary

- The Responsiveness Summary serves three purposes.
  - First, it provides the U. S. Army, USEPA, and TCEQ with information about community concerns with the preferred alternative at LHAAP-47 as presented in the Proposed Plan.
  - Second, it shows how the public's comments were considered in the decision-making process for selection of the remedy.
  - Third, it provides a formal mechanism for the U.S. Army to respond to public comments.

LHAAP-47 Record of Decision Responsiveness Summary

- Responsiveness Summary: Review (*Handouts Provided Have the Full Summary*)
  - Written and verbal questions/comments addressed Revised Proposed during the public comment period and public meetings.
- Comment Categories:
  - Thermal Treatment Technology (TTT): Implementation at Other Sites; Schedule/Timeline for implementing at other Longhorn sites; Power Source for TTT; Temperature Required for TTT to Work on Groundwater.
  - Metals (Arsenic): Maximum Cleanup Level (MCL)/Background Study; Testing at Building 46A; Need to Develop Explicit/Quantifiable Criteria to Address Cleanup of Metals.
  - Perchlorate Cleanup Levels in Groundwater.

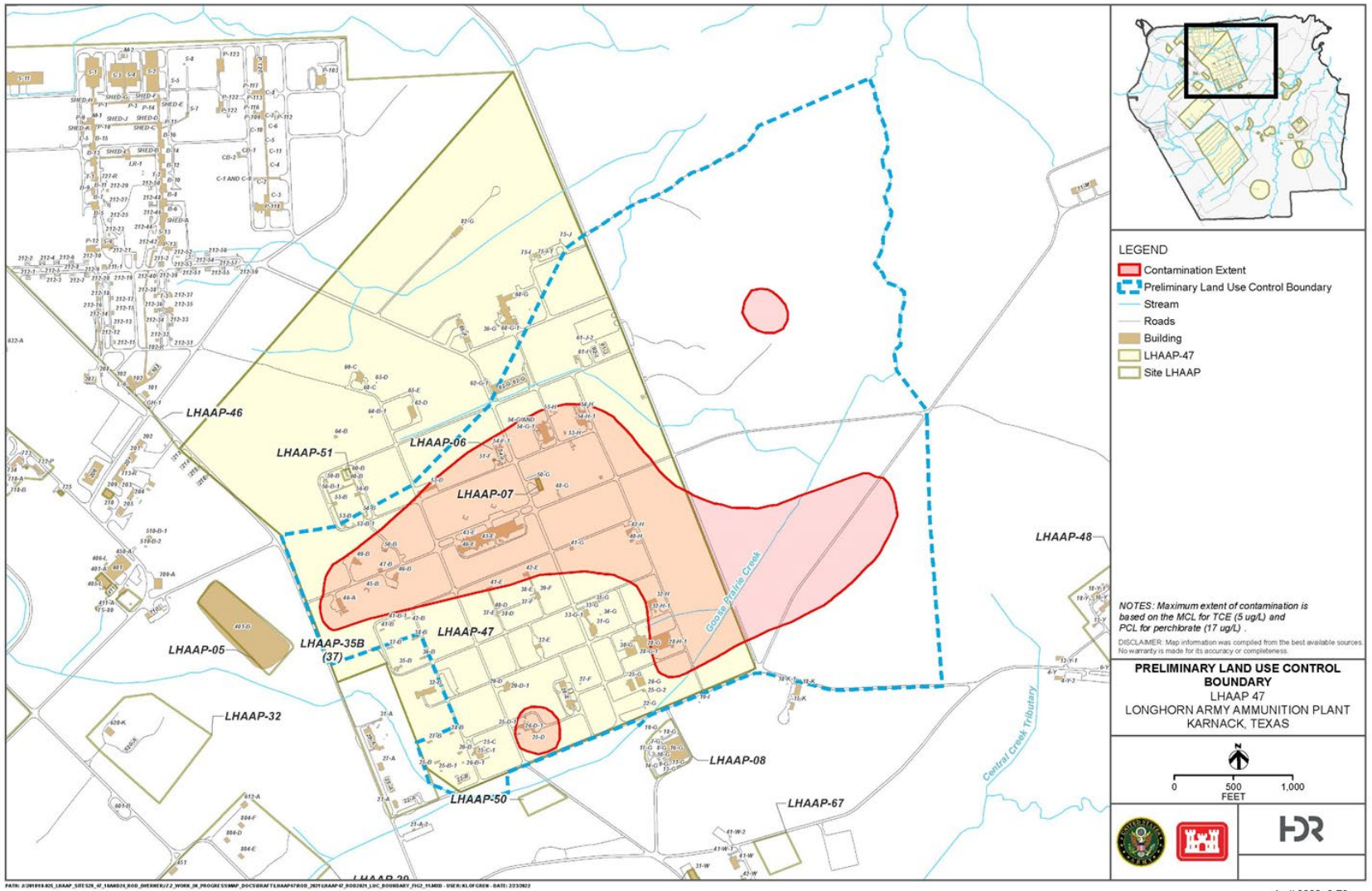
LHAAP-47 Record of Decision Responsiveness Summary

- Comment Categories (cont.d):
  - Surface Water Modeling: Effect of Groundwater Contaminants on Surface Water in Goose Prairie (Reassess).
  - Time to Complete Cleanup: Evaluation of Alternative that Would Shorten Cleanup Time.
  - Natural Attenuation: Effectiveness of Natural Attenuation on Trichloroethene in Groundwater; Use of Quantifiable Criteria to Determine Natural Attenuation is Reducing Contaminant Concentrations at an Acceptable Rate; Estimation of Natural Attenuation Rates (Use of Half-lives that Do Not Meet USEPA Criteria).
  - Estimation of Hydraulic Conductivity: Use of Slug Test Data vs. Pump Test Data.

LHAAP-47 Record of Decision

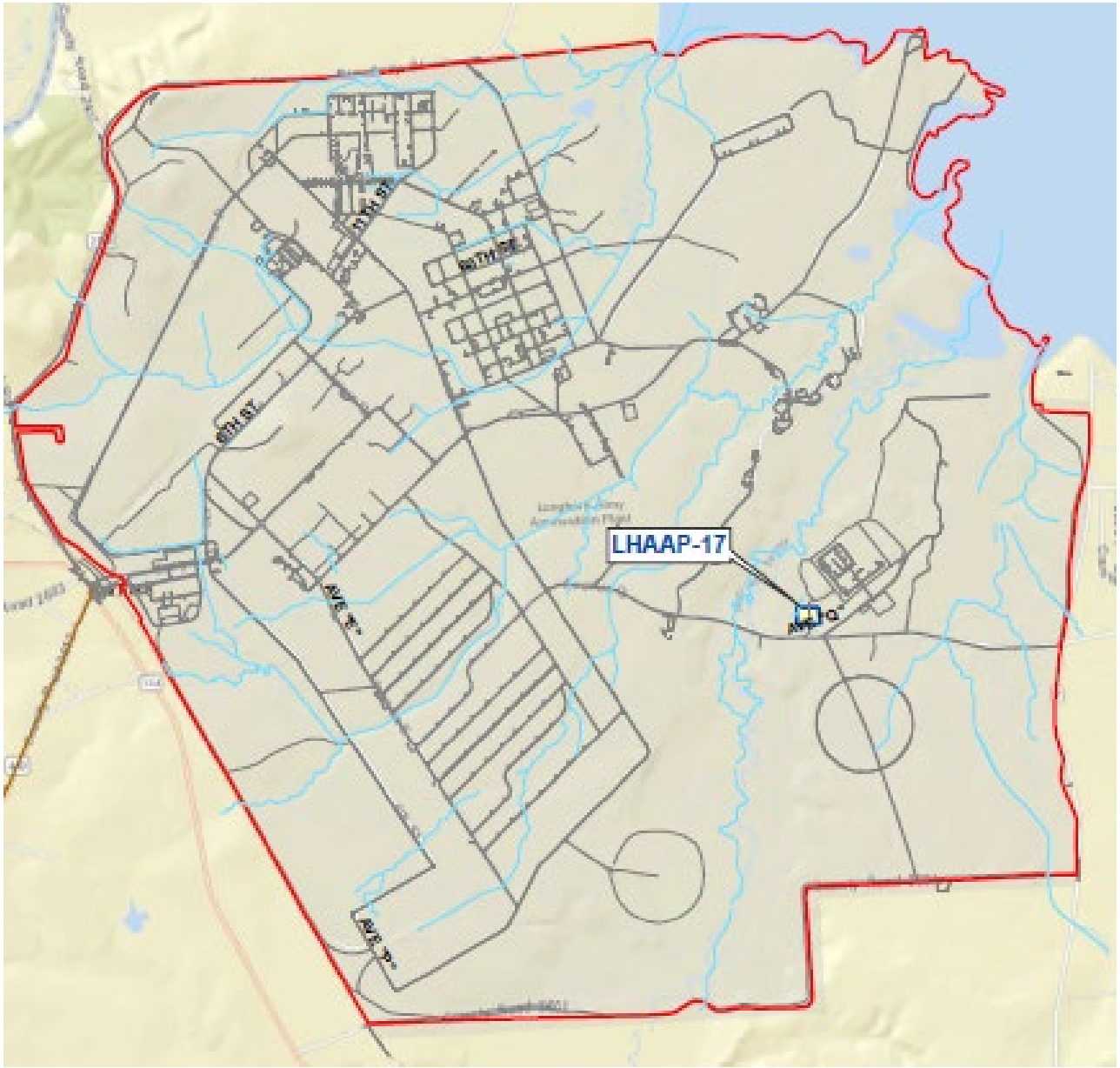
- Land Use Controls:
  - Groundwater use prohibited (except for environmental monitoring and testing).
  - Nonresidential land use.
  - Integrity of any current or future remedial or monitoring systems shall be maintained.

LHAAP-47 Record of Decision



April 2022 2-79

MMG-TLI Joint Venture Update



LHAAP-17 Time Critical Removal Action

- Major Work Elements:
  - Civil survey, Vegetation removal & Erosion control repair
  - Robotic sifting of all pre-existing soil piles to remove potential Munitions and Explosives of Concern (MEC)
  - Confirmation sampling and analysis to confirm excavation extents
  - Backfilling in areas previously determined clean
  - Off-site disposal of sifted soils
  - Complete excavations and receive regulatory approval to backfill all areas
  - Complete geophysical survey across the site to identify subsurface anomalies (i.e., targets) that may be MEC
  - Dig/remove identified targets
  - Install the groundwater extraction system components and site restoration

LHAAP-17

- Status:
  - All soil piles have been sifted and disposed of off-site
  - Over 4,048 cubic yards of soil have been excavated and approximately 2,500 cubic yards of this material have been sifted and transported for off-site disposal
  - All excavations with validated confirmation samples are complete and backfilled
  - 96 Munitions and Explosives of Concern (MEC) items have been disposed of through on-site detonations
  - An estimated 41,000 pounds of Non-Munitions Related debris and 18,700 pounds of Munitions Debris have been inspected and transported off-site for recycling/disposal
  - Groundwater extraction system installation is complete and operating per the design

LHAAP-17 Groundwater Extraction System Installation

- Groundwater extraction system installation was initiated in May 2022.
- Extraction system components include:
  - Overhead electrical power lines
  - Extraction system shed which houses a 2,500 gallon double walled storage tank, air compressor, transfer pump, and the programmable logic control (PLC) system
  - PLC system allows the extraction of groundwater to be automated and integrated into the groundwater treatment plant (GWTP) system
  - Underground groundwater conveyance piping connecting extraction wells to the system shed, and the system shed to the GWTP
  - Each extraction well is equipped with a submersible air diaphragm extraction pump
- Groundwater extraction began on 5 August 2022.
- As of 30 September 2022, approximately 121,400 gallons of groundwater has been extracted and pumped to the GWTP for treatment.

LHAAP-17 Groundwater Extraction System Installation

Other Discussion RAB Discussions

- Metals Discussion
- Transfer Update

Next RAB Meeting Schedule & Closing Remarks

- Schedule Next Restoration Advisory Board Meeting
  - 15 February 2023
- 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

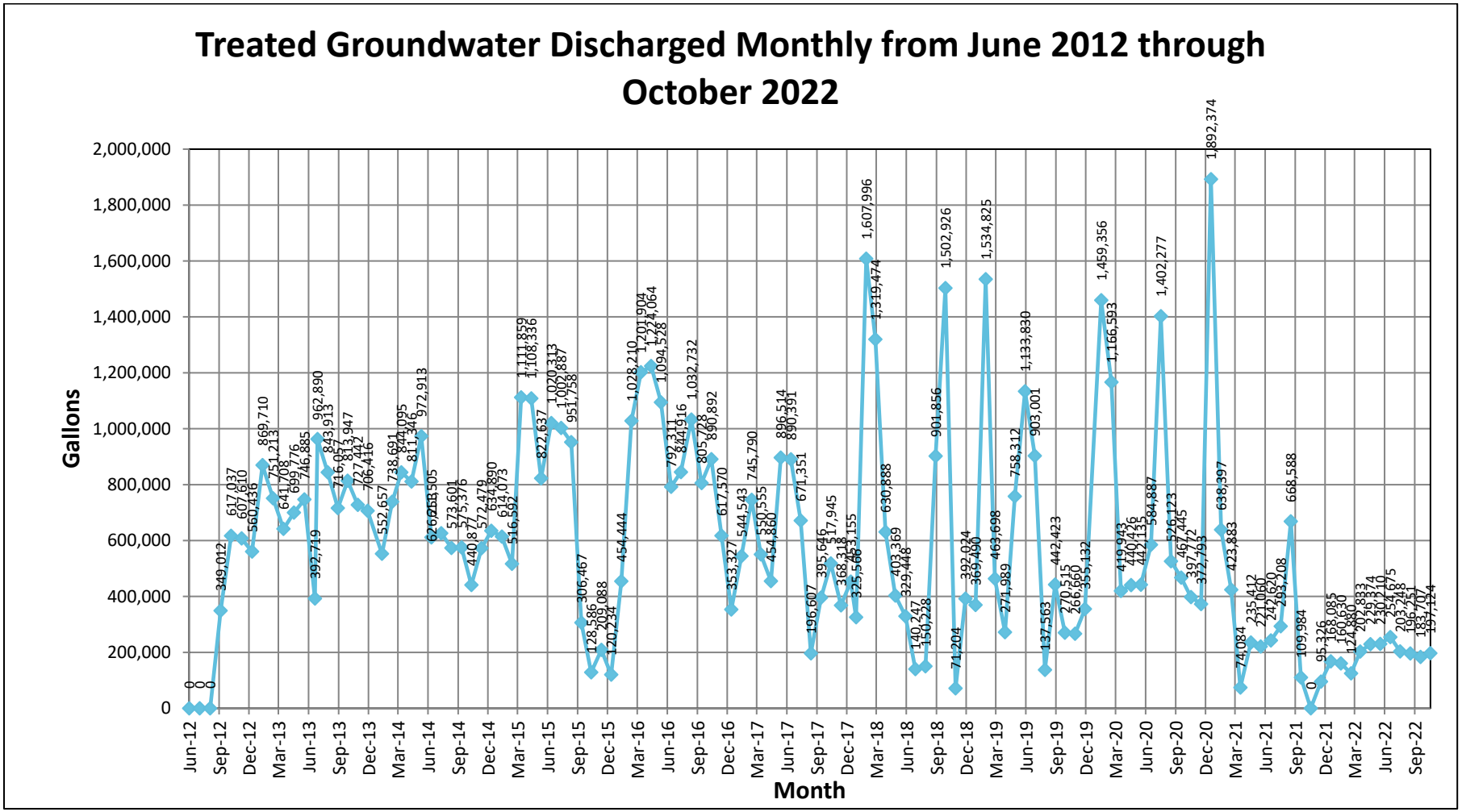
Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20
270,515	288,683	355,132	1,459,356	1,166,593	419,943	440,426	442,135	584,887	1,402,277	539,526	467,445

Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21
397,772	372,793	1,832,274	638,397	423,883	74,084	235,412	1,121,060	242,620	293,208	668,588	109,984

Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
0	95,326	439,585	322,130	124,880	202,833	229,374	230,210	254,675	203,248	196,251	183,707

Oct-22
197,124

*Indicates Estimate



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
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

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
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	1,832,274	0	60,199	1,571,432	0
Jan-21	638,397	0	0	383,318	0
Feb-21	423,883	0	0	259,875	0
Mar-21	74,084	0	0	74,084	0
Apr-21	235,412	0	0	0	0
May-21	1,121,060	0	0	900,000	0
Jun-21	242,620	0	0	0	0
Jul-21	293,208	0	0	243,675	0
Aug-21	668,588	0	0	561,527	0
Sep-21	0	0	109,984	0	0
Oct-21	0	0	0	0	0
Nov-21	0	0	95,326	0	0
Dec-21	271,500	0	168,085	271,500	0
Jan-22	161,500	0	160,630	161,500	0
Feb-22	0	0	124,880	0	0
Mar-22	190,898	0	11,935	0	0
Apr-22	229,374	0	0	0	0
May-22	230,210	0	0	0	0
June-22	254,675	0	0	0	0
July-22	0	0	203,248	0	0
Aug-22	34,115	0	162,136	0	0
Sept-22	83,312	0	100,395	0	0
Oct-22	0	0	197,124	0	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

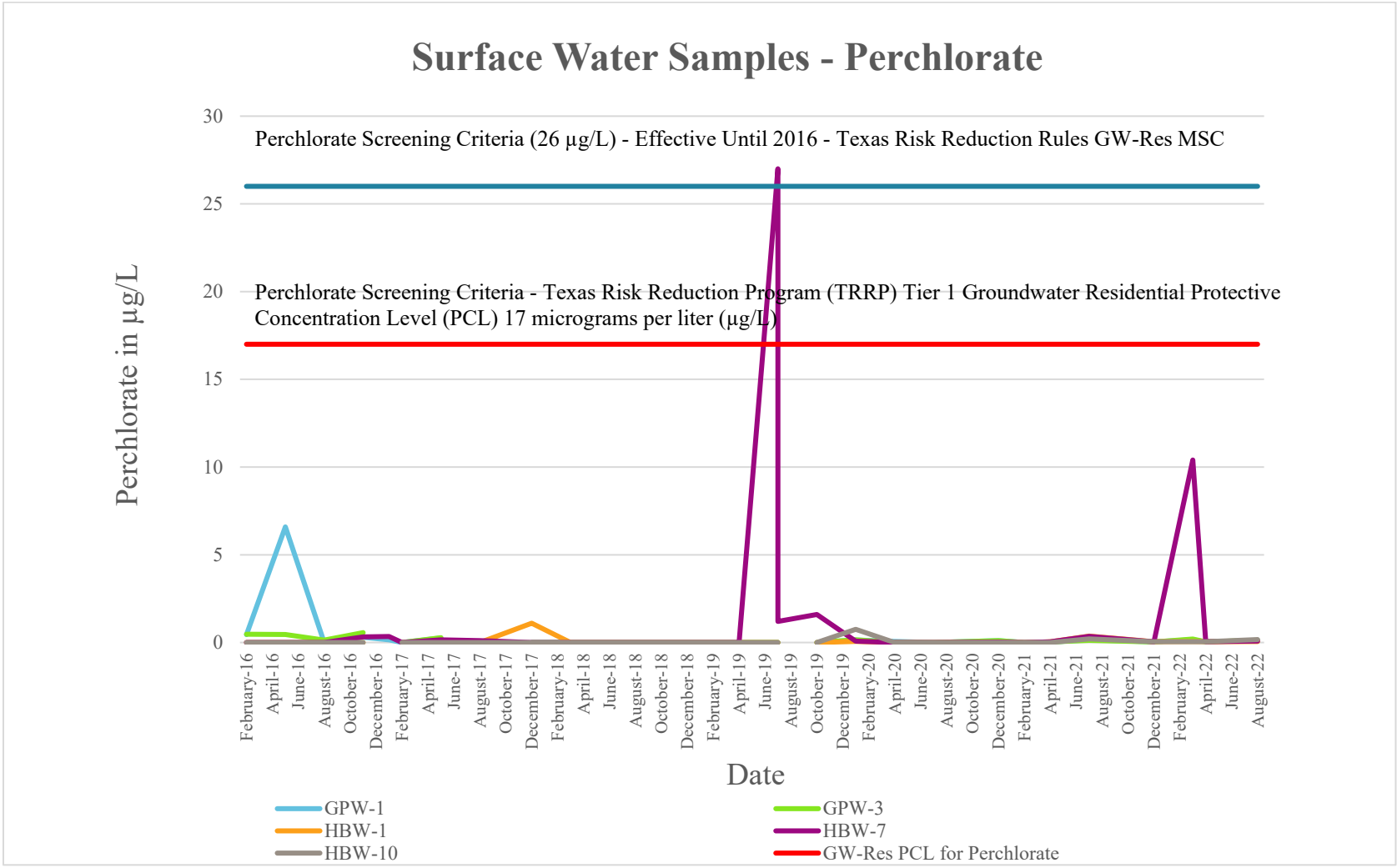
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
Creek Sample ID	**Feb 2016**	**May 2016**	**Aug 2016**	**Nov 2016**	**Feb 2017**	**May 2017**	**Aug 2017**	**Dec 2017**	**Mar 2018**	**Jun 2018**	**Aug 2018**
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	Dry	<2.0 U	<2.0 U	Dry	<2.0 U
GPW-3	0.474	0.457	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	1st
Creek Sample ID	**Oct 2018**	**Jan 2019**	**Apr 2019**	**Jul 2019**	**Oct 2019**	**Jan 2020**	**Apr 2020**	**Jul 2020**	**Dec 2020**	**Feb 2021**
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	<0.05 U
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	<0.05 U
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	0.0374 J	<0.05 U
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	<0.05 U
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	<0.05 U

Quarter	2nd	3rd	4th	1st	2nd	3rd
Creek Sample ID	**Apr 2021**	**Jul 2021**	**Dec 2021**	**Mar 2022**	**Apr 2022**	**Aug 2022**
GPW-1	0.0268 J	0.154	0.0394 J	0.162	0.042 J	0.104
GPW-3	0.0321 J	0.122	0.0344 J	0.198	0.0384 J	0.132
HBW-1	0.0410 J	0.369	0.050 U	0.052 J	<0.05 U	0.0540 J
HBW-7	0.0373 J	0.348	0.0359 J	10.4	0.0493 J	0.0880 J
HBW-10	<0.05 U	0.207	0.0464 J	<0.05 U	<0.05 U	0.171

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