



**Subject: Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting
Longhorn Army Ammunition Plant (LHAAP)**

Location of Meeting: Community Center, Karnack, TX

Date of Meeting: 14 November 2024, 5:00-6:00 PM Central Standard Time (CST)

Meeting Participants:

USACE:	Aaron Williams
USAEC:	Mike Bowlby
PCI/Bhate JV:	Zachary Beck, Kelsey Edwards, and Michelle Schwartz
USEPA:	Joel Reyes and Janetta Coats
TCEQ:	April Palmie
APTIM:	Bill Foss
RAB:	Present: Tom Walker, Eugene Byrd, John Fortune, Sharron McAvoy Absent: Judy VanDeventer, Deon Hall, Nigel Shivers, Donna Burney, Terry Britt, and Margaret Roland
Public:	Laura-Ashley Overdyke (Executive Director of the Caddo Lake Institute), Eddy Young, Laura Omer, and Ellen Danielson

An agenda for the RAB meeting, a color copy of the Poarch Creek Indians [PCI] /Bhate Environmental Associates, Inc. [Bhate] Joint Venture (PCI-Bhate JV) slide presentation, and handouts (see list at end of meeting minutes) were provided for meeting attendees.

Welcome and Introduction

Mr. Mike Bowlby with the United States Army Environmental Command (USAEC) called the RAB meeting to order at 5:05 pm CST. Mr. John Fortune offered the motion to approve the June 2024 RAB meeting minutes and Mr. Eugene Byrd seconded the motion.

Opening Items

Mr. Bowlby encouraged all attendees to join the RAB, which he explained can be done by completing the application found on the website, www.longhornaap.com.

Mr. Bowlby discussed the frequency of in-person RAB meetings, inquiring whether one meeting a year would be better for everyone's schedule compared to three annual meetings (a meeting every three months) as there was very little current information to present at each meeting with them held so frequently. Mr. Fortune asked about getting notifications about any significant developments that may occur on the site. Ms. Laura-Ashley Overdyke, the Executive Director of the Caddo Lake Institute, recommended that a quarterly report be provided for the RAB to keep them informed about any updates on the site. Mr. Bowlby agreed that would be easy to do and requested the RAB provide feedback on the format of the first quarterly report to ensure it met expectations. Ms. Janetta Coats, the Community Involvement Coordinator, with the Environmental Protection Agency (EPA) suggested additional RAB meetings could be held as necessary and that at a minimum an annual meeting should be held.



Mr. Bowlby motioned to change the RAB meetings to once annually and replace the other two RAB meetings with quarterly reports and communication with the RAB as needed. The RAB voted unanimously in favor of this motion to change the RAB meeting frequency.

After agreeing to the reduced RAB meeting frequency, Ms. Overdyke requested that the informational fact sheet and site “cheat sheet” be included in the quarterly reports.

Five Year Review

Mr. Bowlby discussed the status of the Five-Year Review, explaining that the report was drafted and the contractors had received comments back from the Texas Commission on Environmental Quality (TCEQ), but comments were still pending from the EPA. Mr. Bowlby stated the report was nearly complete, and only minor comments and changes were needed before the report was finalized.

Per- and Polyfluoroalkyl Substances (PFAS) Update

Mr. Bowlby discussed that the site visit with potential contractors for the Remedial Investigation (RI) was concluded on 13 November 2024. During this discussion, concern was raised by Mr. Eddy Young and Ms. Overdyke about the deer hunt that had occurred during that day and whether PFAS could potentially be in the deer tissue. Mr. Bowlby explained that the PFAS cleanup was still in its early stages and that only a preliminary assessment and a site investigation had occurred. Ms. April Palmie from TCEQ added that a human health and ecological risk assessment would be included as part of the remedial investigation (RI). Mr. Bill Foss from APTIM explained that the development of risk-based limits for PFAS was still very new and that ecological risk information was still needed to understand the human health risk for scenarios such as consumption of venison.

Groundwater Treatment Plant (GWTP)

Mr. Zachary Beck from PCI-Bhate JV provided the GWTP update for November 2023 - October 2024. Mr. Beck explained the layout of the GWTP and explained the latest updates to the system. Mr. Beck discussed the installation of a bypass line around the metal pretreatment system to yield greater flow rates, yet allowing water to be diverted into the metal pretreatment system if the metal concentrations require treatment. Mr. Beck also stated that the ion exchange resin would be replaced in December 2024.

During his presentation on the GWTP, Mr. Beck also discussed the surface water sampling that was conducted around the site. Mr. Fortune asked where surface water was collected and whether it was sampled from the mouth of the creek. Mr. Beck explained that samples were collected at multiple locations on both Harrison Bayou and Goose Prairie Creek. Mr. Beck pointed out that the surface water sampling locations are located downgradient of sites with perchlorate groundwater detections as well as downgradient of the GWTP discharge point.

LHAAP-16



Mr. Bill Foss presented an update on the conceptual site model for LHAAP-16. Mr. Foss explained that APTIM first conducted a detailed topographic survey to identify areas where surface topography could influence the flow of groundwater in the shallow zone, then showed examples where the influence of the topography and changes in rainfall over time caused changes in the shallow groundwater flow direction. Mr. Foss pointed out that the change in flow direction from eastward to southeastward indicated that there is a possibility of groundwater missing the southern portion of the bio-barrier between the mid-plume area and Harrison Bayou. Mr. Foss stated that additional wells would be needed to determine how far contamination had reached on the east side of Harrison Bayou.

Mr. Foss also discussed the evaluation of newly constructed cross sections of the site. Using soil logs from monitoring well installation, APTIM was able to develop a cross-section of the site and identify the boundaries of the shallow zone aquifer and the intermediate zone aquifer. Within the cross-section along the Harrison Bayou, APTIM identified that at least one well previously considered to be part of the “shallow zone” aquifer was in fact within the intermediate zone aquifer. Mr. Foss identified this as another data gap that would need to be addressed with a new shallow well.

During the discussion, Mr. Eugene Byrd asked about contamination in wildlife, which was previously mentioned during the PFAS RI update. Mr. Foss explained that all surface water samples were non-detect for the contaminants of concern (COCs) at the site and that an ecological risk assessment had been performed for the site. Mr. Aaron Williams from the United States Army Corps of Engineers (USACE) stated that these results had previously been presented at a RAB meeting. Further, Mr. Foss explained that the COCs at this site had very different properties than PFAS and that the contaminants were most likely to volatilize and not bioaccumulate within fish or animals.

LHAAP-17

Mr. Beck presented a status update on LHAAP-17. Mr. Beck explained the history of the site including previous excavation and removal of munitions and explosives of concern (MEC) and ongoing groundwater extraction status. Mr. Beck discussed perchlorate in groundwater at LHAAP-17 has been decreasing steadily once extraction was initiated and explained the difference between excavation (which is the removal of soils and solid material) and extraction (which is the pumping of groundwater). Mr. Fortune asked if perchlorate concentrations were decreasing due to high pumping rates, and Mr. Beck confirmed that to be the case.

Next RAB Meeting Schedule and Closing Remarks

Before adjourning, Mr. Bowlby explained the details for the revised RAB schedule. Mr. Bowlby stated that the quarterly reports would be provided in March, June, and September of each year and the year would conclude with an in-person meeting to be held in November.



Mr. Bowlby also discussed that there was a possibility that a co-chair would need to be elected from the community participants.

Finally, Ms. Overdyke requested that during the property transfer from LHAAP to the U.S. Fish and Wildlife Service that the water rights should also be transferred. Mr. Bowlby said that he would look into the specifics of the property transfer process further.

The next RAB meeting is scheduled for 5:00 pm on 13 November 2025.

Adjourn

Mr. Fortune motioned to adjourn the meeting at 6:10 pm CST. Mr. Bowlby seconded.

November 2024 Meeting Attachments and Handouts:

- Agenda
- Color Copy of PBJV Presentation Slides
- Fact Sheet
- Harrison Bayou and Goose Prairie Creek – Perchlorate Data
- Groundwater Treatment Plant - Processed Groundwater Volumes



LONGHORN ARMY AMMUNITION PLANT (LHAAP)

Restoration Advisory Board
Quarterly Update

14 NOVEMBER 2024

AGENDA

Welcome and Introduction

Open Items

- Ongoing Outreach/Website
- Restoration Advisory Board (RAB) Administrative Items
- Minutes (November 2023 RAB Meeting)

Defense Environmental Restoration Program (DERP) Update

- Five-Year Review
- PFAS Update
- Groundwater Treatment Plant Update
- LHAAP-16
- LHAAP-17 Status

Next RAB Meeting Schedule and Closing Remarks

THE ARMY WANTS YOU TO BE INFORMED AND INVOLVED

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 Restoration Advisory Board (RAB) Meetings and/or become a member of the RAB.
- Visit the Longhorn environmental website, which is regularly updated, at <http://longhornaap.com/>.
- Make suggestions for improving communication – the Army welcomes and appreciates community feedback.

ADMINISTRATIVE ITEMS

Restoration Advisory Board (RAB) Membership Update

- Persons interested in being new members.

Minutes (November 2023 RAB Meeting)

Discuss frequency and scheduling of in-person RAB meetings

FIVE-YEAR REVIEW

Five-Year Review process and report

- Fifth Five-Year Review conducted at LHAAP.
- Purpose is to evaluate the implementation and performance of a remedy in order to determine if the remedy is protective of human health and the environment.

Sites Covered

- LHAAP-001-R-01: South Test Area/Bomb Test Area
- LHAAP-003-R-01: Ground Signal Test Area
- LHAAP-003: Former Waste Collection Pad Building 722-P Paint Shop
- LHAAP-004-R-01: Pistol Range, LHAAP-04: Former Pilot Wastewater Treatment Plant
- LHAAP-012: Active Landfill, LHAAP-016: Old Landfill
- LHAAP-017: Burning Ground No. 2 Flashing Area, Group 2
- LHAAP-018/LHAAP-024: Burning Ground and Washout Pond/Formal Unlined Evaporation Pond

FIVE-YEAR REVIEW (CONTINUED)

Sites Covered (continued)

- LHAAP-037: Chemical Laboratory Waste Pad
- LHAAP-046: Plant 2 Area, LHAAP-049: Former Acid Storage Area
- LHAAP-050: Former Waste Disposal Facility
- LHAAP-058: Maintenance Complex
- LHAAP-067: Above Ground Storage Tank

PFAS UPDATE

Preliminary Assessment (PA)/ Site Inspection (SI) Update

- Investigated 12 Areas of Potential Interest (AOPI) based on historical use, storage, and/or disposal, or areas where known or suspected releases to the environment occurred.
- Eight of the 12 AOPIs had PFAS compounds detected in soil and/or groundwater at concentrations greater than the risk-based screening levels and thus are recommended for further remedial investigation.

Next Steps- Remedial Investigation (RI)

To be placed on contract in FY25

LHAAP ENVIRONMENTAL CONTRACTORS

Poarch Creek Indians (PCI)/Bhate Joint Venture:

- LHAAP-04, LHAAP-12, LHAAP-16, LHAAP-35B (37), LHAAP-46, LHAAP-50, LHAAP-35A (58), LHAAP-67, LHAAP-001-R-01, LHAAP-003-R-01, and LHAAP-18/24 (interim remedy).

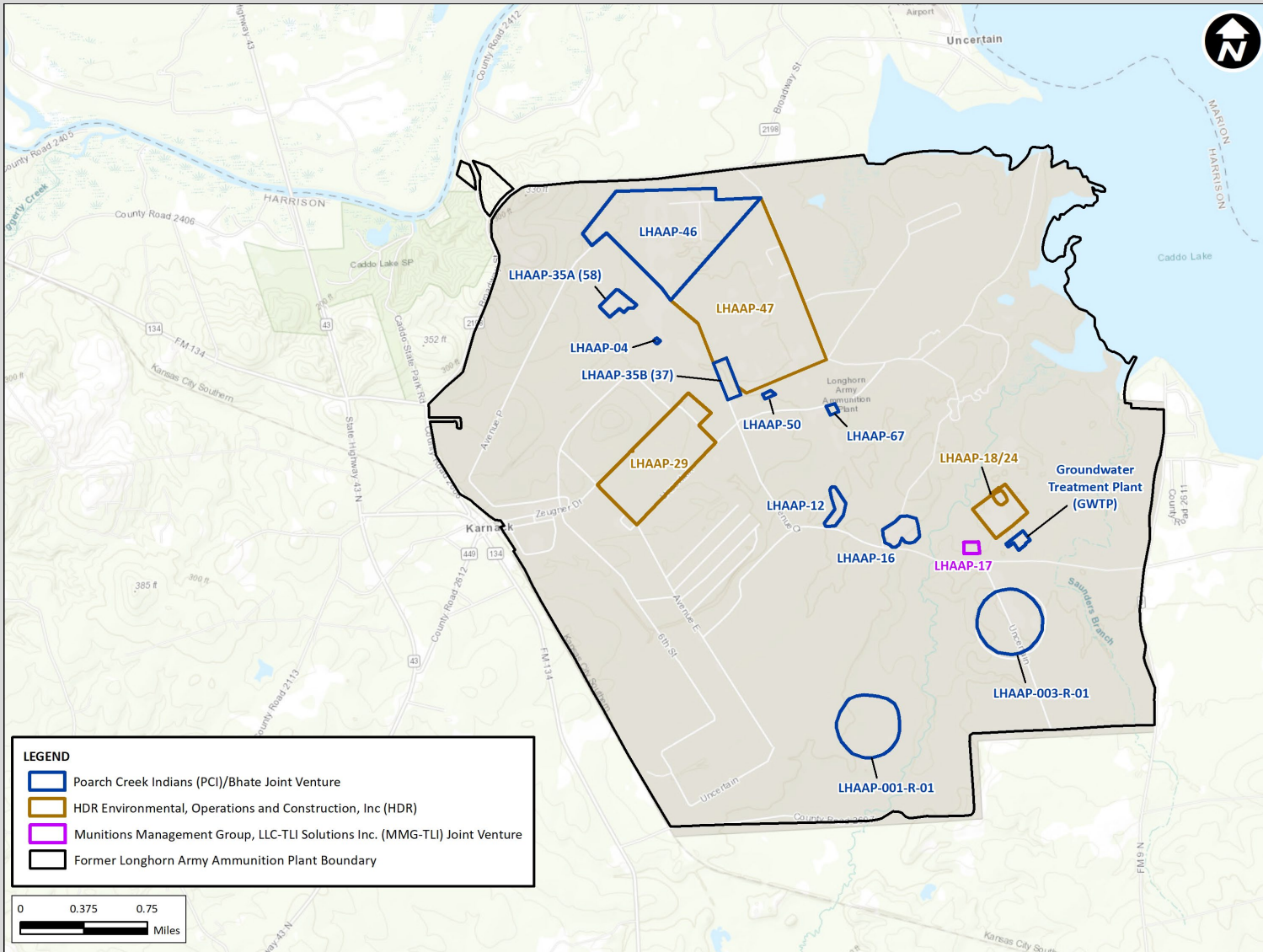
HDR Environmental, Operations and Construction, Inc (HDR)

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

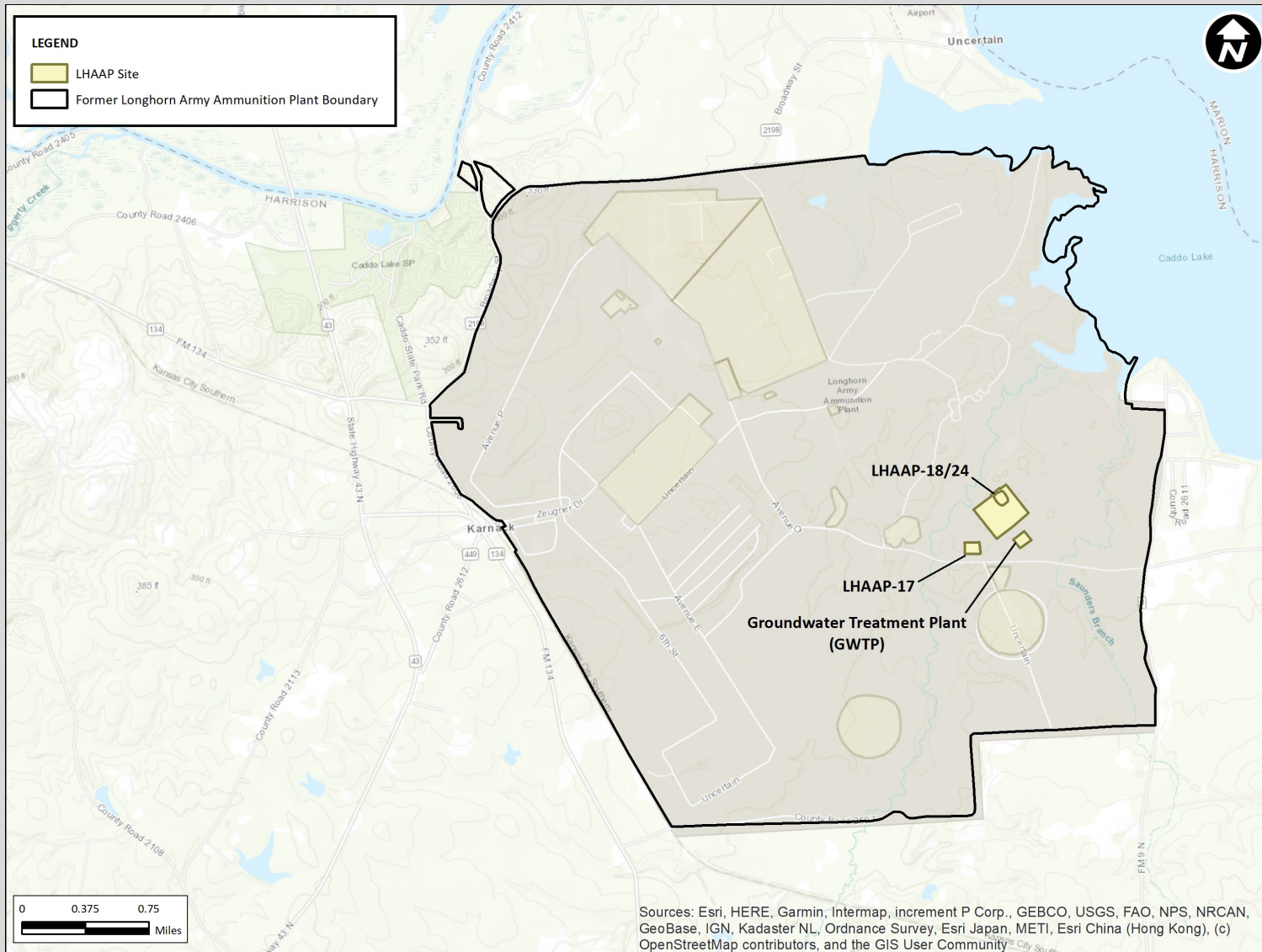
Munitions Management Group, LLC-TLI Solutions Inc. (MMG-TLI) Joint Venture:

- LHAAP-17.

LHAAP SITE MAP



GROUNDWATER TREATMENT PLANT UPDATE



GROUNDWATER TREATMENT PLANT UPDATE

Groundwater Treatment Plant (GWTP) Design

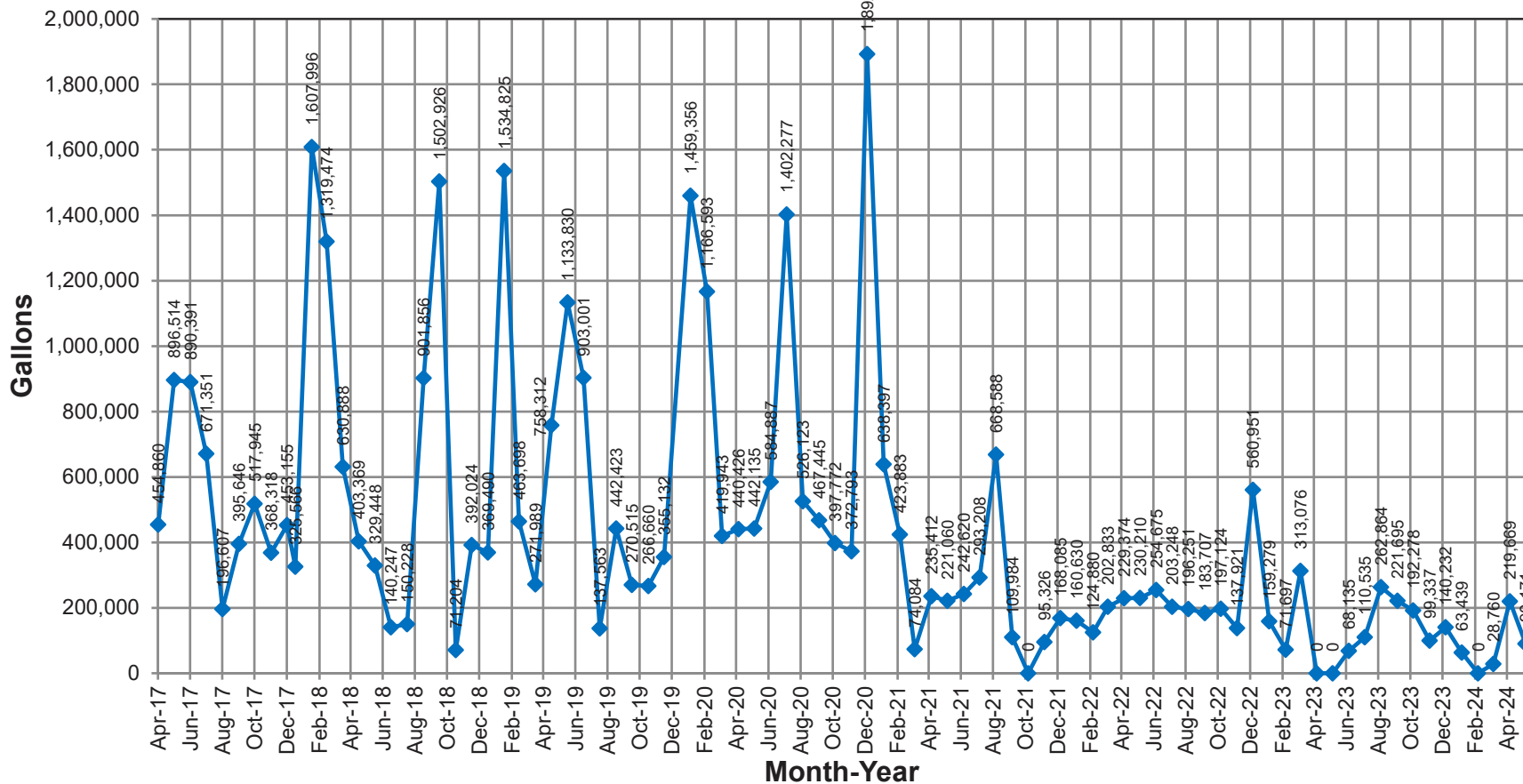
- Metals treatment system
- Volatile organics treated via an air stripper
- Perchlorate treated via a Fluidized Bed Reactor (FBR): [Envirogen FBR Video](#)
- Ion exchange system

GWTP Operations (November 2023 – June 2024):

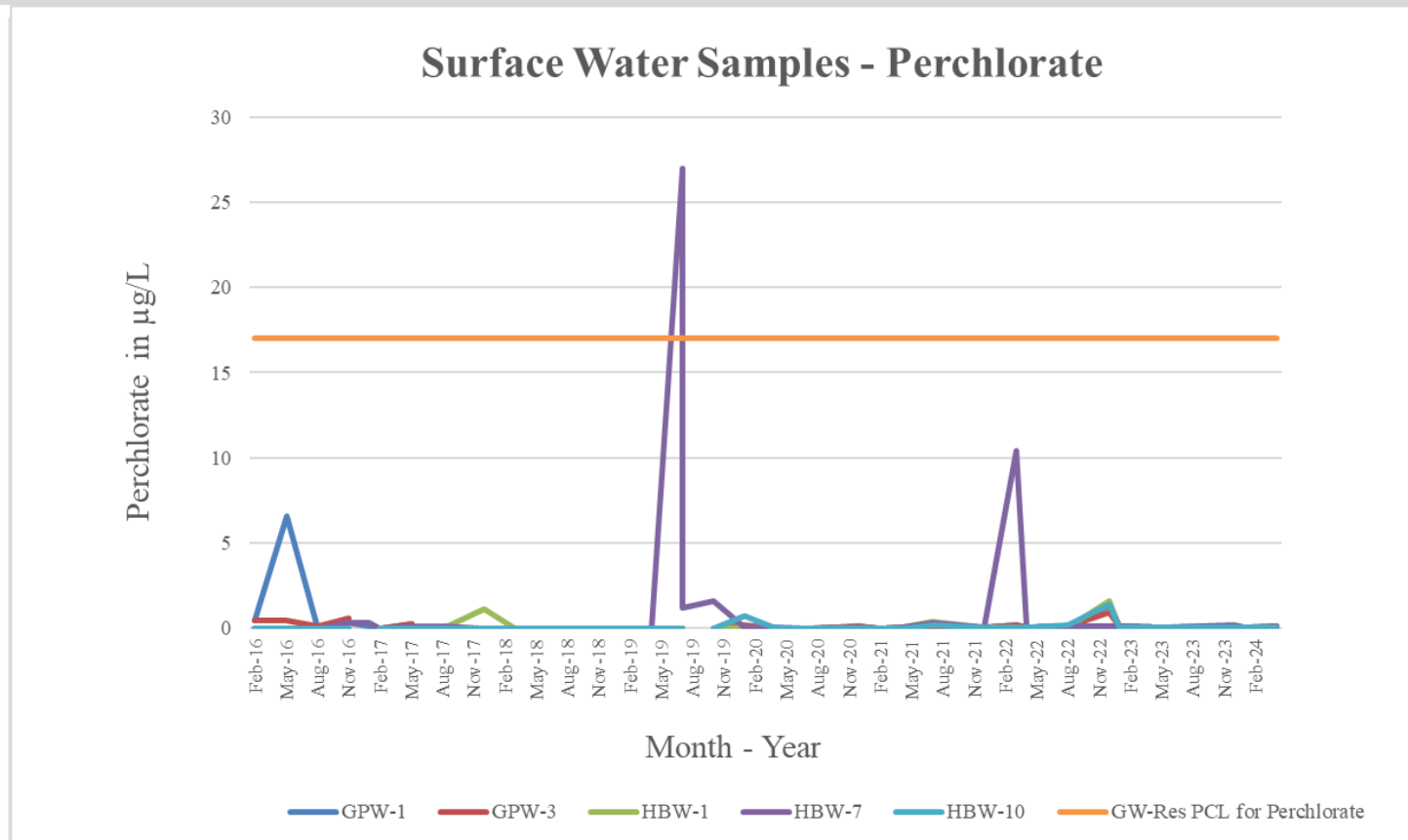
- November 2023 – Exterior LED lighting installed.
- Mid-January 2024 – February 2024 – GWTP shutdown due to freeze damage sustained on 16 January 2024.
- March 2024 – GWTP operations restarted after repairs were completed.
 - FBR (re)startup/evaluation
- – GWTP returned to full operation.
- June 2024 – Additional repairs planned including replacement of the ion exchange media.

GROUNDWATER TREATMENT PLANT DISCHARGE UPDATE

**Treated Groundwater Discharged Monthly from April 2017
through May 2024**

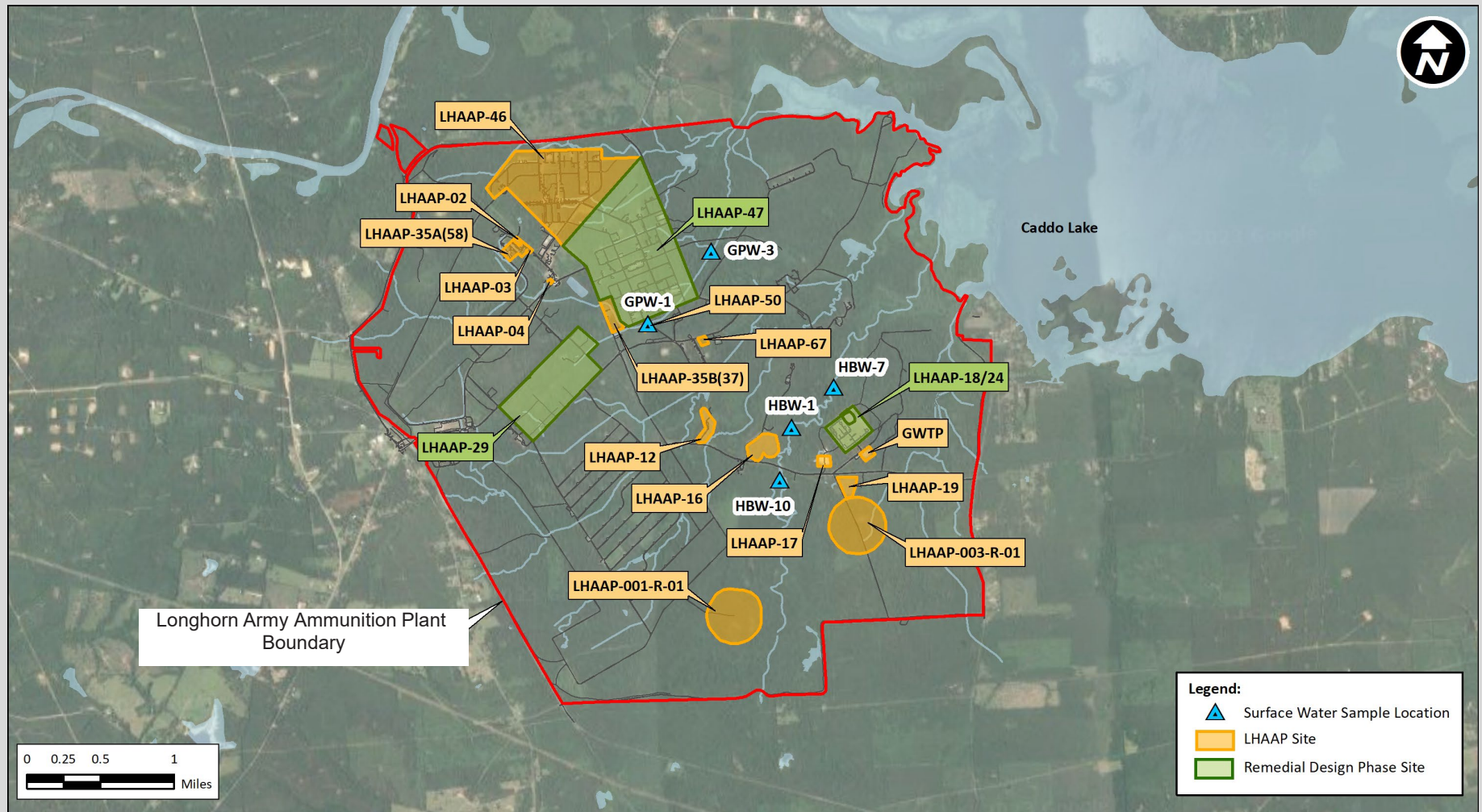


SURFACE WATER SAMPLE RESULTS

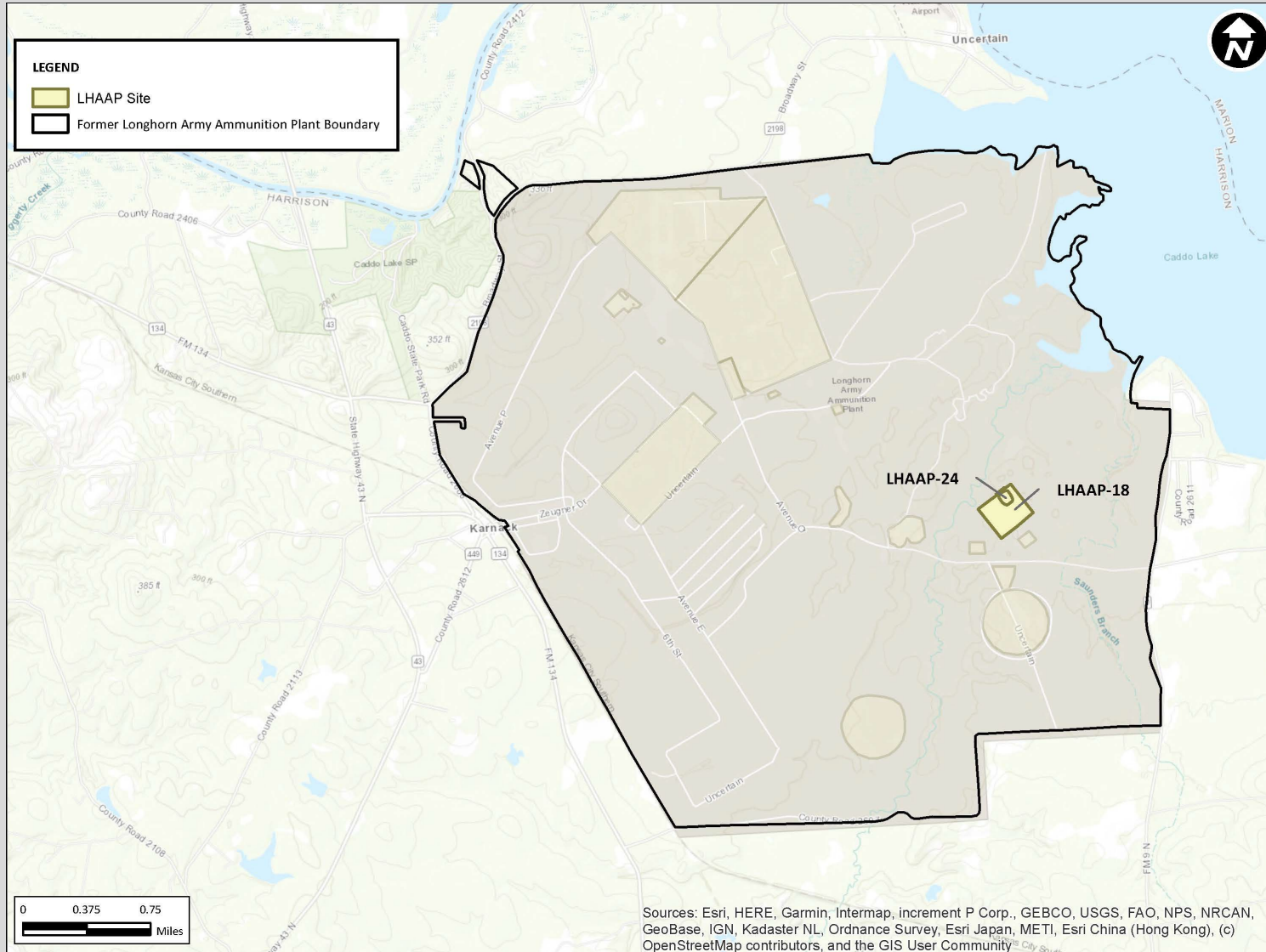


Note: Surface water at HBW-7 had a detection of 27 $\mu\text{g/L}$ from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J (estimated result) $\mu\text{g/L}$. GPW – Goose Prairie Creek sample location; HBW – Harrison Bayou sample location. GW Res – Groundwater residential limit; MSC – Medium Specific Concentration; PCL – Protective Concentration Level; $\mu\text{g/L}$ – micrograms per liter. No surface water sampling was conducted in the 3rd Quarter 2023 due to dry conditions.

SURFACE WATER SAMPLE LOCATIONS



LHAAP-16 UPDATE

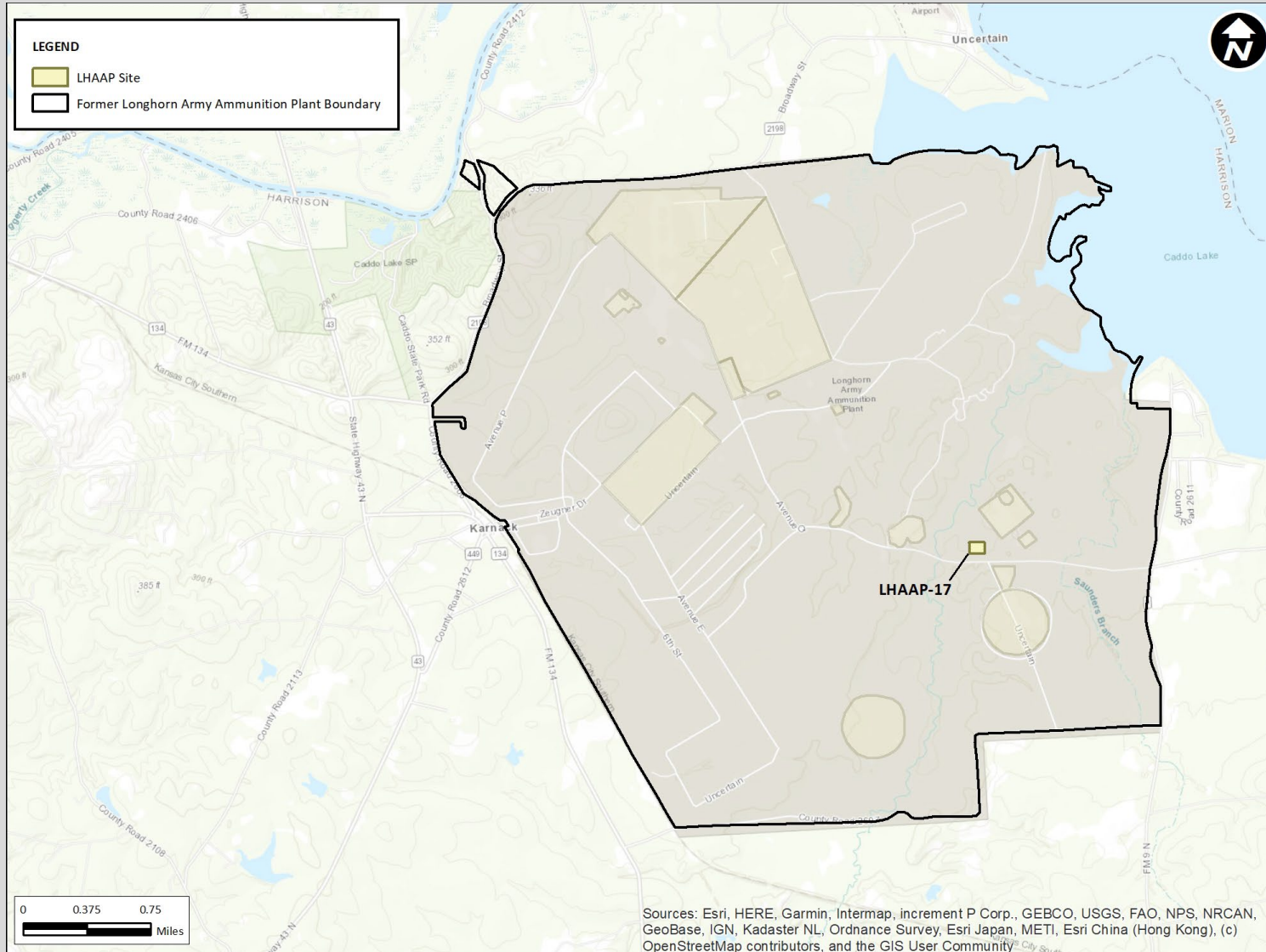


LHAAP-16 UPDATE

Background

- APTIM

LHAAP-17 UPDATE



LHAAP-17 BACKGROUND

Background:

- Burning Ground No. 2/Flashing Area (LHAAP-17) was used as a burning ground from 1959 through 1980. Bulk trinitrotoluene (TNT) and photo flash powder were burned.
- The site was also used as a flashing area to decontaminate recoverable metal byproducts until 1980, when it became inactive.
- The waste residues were reportedly removed from the trenches in 1984, and the site was allowed to revegetate.
- The Record Of Decision, finalized in September 2016, included excavation and off-site disposal of soil, groundwater extraction, monitored natural attenuation (MNA), and land use controls (LUCs) to maintain the remedy and prohibit groundwater use.
- However, during excavation activities, a work stoppage occurred on 30 September 2019, due to the presence of munitions hazards not previously known to be present.
- Time Critical Removal Action (TCRA) determined appropriate.

LHAAP-17 STATUS

Time Critical Removal Action Status:

- Over 4,048 cubic yards of soil were excavated in June 2021 through August 2022 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 Status:

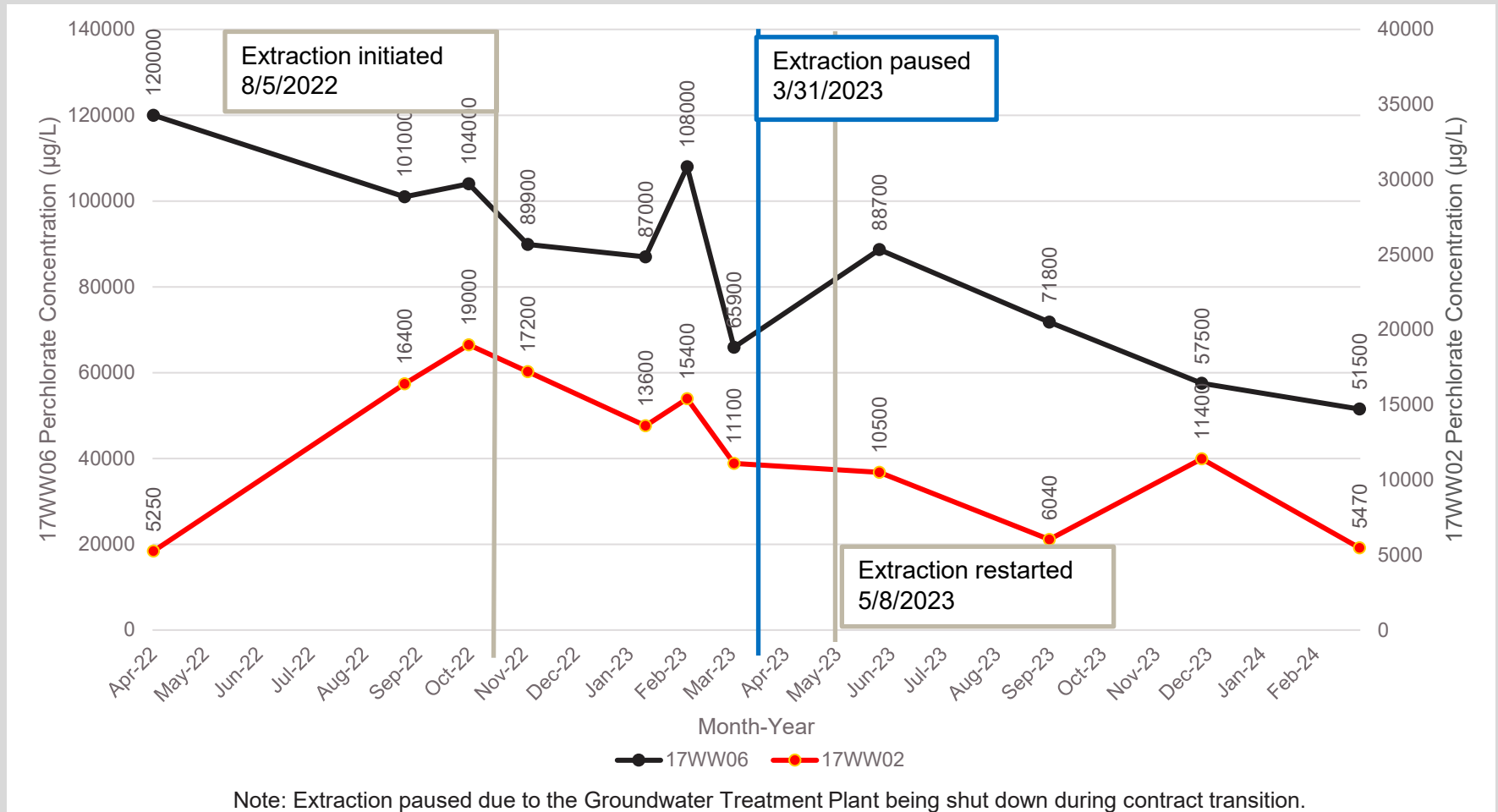
- Groundwater extraction system installation was completed in August 2022 and is operating per the design.
- Performance monitoring is ongoing.

LHAAP-17 PERFORMANCE MONITORING

Performance Monitoring:

- The groundwater extraction remedial action objective is to reduce perchlorate concentrations sitewide below 20,000 micrograms per liter ($\mu\text{g/L}$). Site will transition to Monitored Natural Attenuation once this threshold is achieved.
- Performance monitoring was completed at 5 sampling locations monthly for 6 months, followed by quarterly sampling for the next 12 months (September 2022 – March 2024).
- All performance monitoring groundwater samples were analyzed for perchlorate. Perchlorate concentrations have decreased across the site with the largest decrease noted at monitoring well 17WW06.
- As of March 2024, perchlorate remains above the remedial action goal (20,000 $\mu\text{g/L}$) at one well (17WW06).
- The extraction and monitoring period was extended in May 2024 until all parties agree on termination as the Time Critical Removal Action (TCRA) is still ongoing. The next performance monitoring event is scheduled for June 2024.

LHAAP-17 PERCHLORATE GROUNDWATER TRENDS



NEXT MEETING SCHEDULE AND CLOSING REMARKS

Schedule Next Restoration Advisory Board Meeting

Other Items/Remarks

Thank You For Coming

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	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd
Creek Sample ID	Feb 2017	May 2017	Aug 2017	Dec 2017	Mar 2018	Jun 2018	Aug 2018
GPW-1	<1 U	0.263	Dry	<2.0 U	<2.0 U	Dry	<2.0 U
GPW-3	<1 U	0.274	Dry	<2.0 U	<2.0 U	Dry	<2.0 U
HBW-1	<1 U	<0.2 U	<0.2 U	1.1 J	<2.0 U	Dry	<2.0 U
HBW-7	<1 U	0.155	<0.2 U	<2.0 U	<2.0 U	Dry	<2.0 U
HBW-10	<1 U	<0.2 U	0.111 J	<2.0 U	<2.0 U	Dry	<2.0 U

Quarter	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st
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

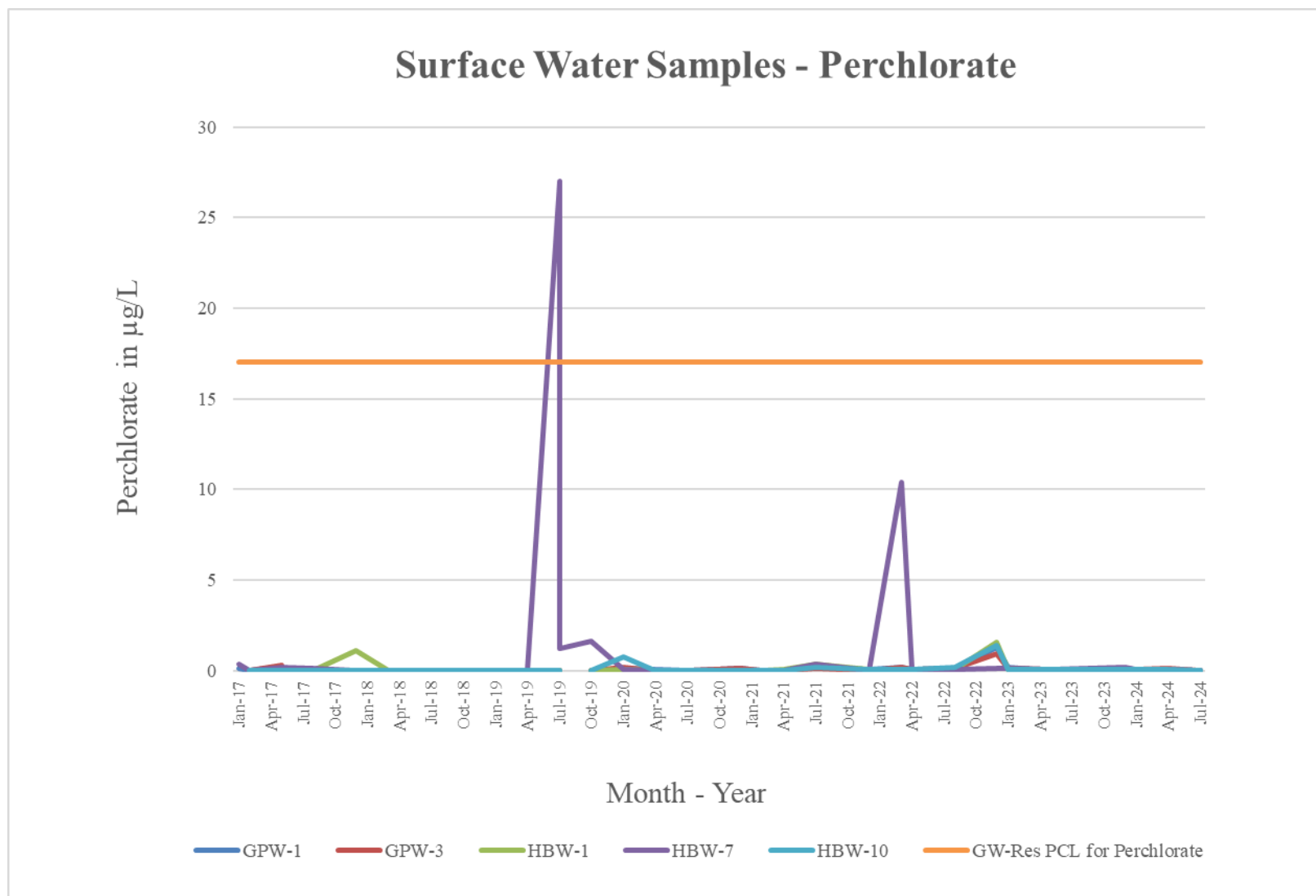
Quarter	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th
Creek Sample ID	Apr 2021	Jul 2021	Dec 2021	Mar 2022	Apr 2022	Aug 2022	Dec 2022	Jan 2023	May 2023	Jul-Sep 2023	Dec 2023
GPW-1	0.0268 J	0.154	0.0394 J	0.162	0.042 J	0.104	1.30	0.153	0.0286 J	Dry	0.0973 J
GPW-3	0.0321 J	0.122	0.0344 J	0.198	0.0384 J	0.132	0.938	0.137	< 0.05 U	Dry	0.0382 J
HBW-1	0.0410 J	0.369	0.050 U	0.052 J	<0.05 U	0.0540 J	1.58	0.0568 J	< 0.05 U	Dry	< 0.05 U
HBW-7	0.0373 J	0.348	0.0359 J	10.4	0.0493 J	0.0880 J	0.125	0.133	< 0.05 U	Dry	0.163
HBW-10	<0.05 U	0.207	0.0464 J	<0.05 U	<0.05 U	0.171	1.39	0.0654 J	< 0.05 U	Dry	0.0546 J

Quarter	1 st	2 nd	3 rd
Creek Sample ID	Jan 2024	Apr 2024	Jul 2024
GPW-1	0.0671 J	0.0907 J	0.0253 J
GPW-3	0.0490 J	0.106	0.0419 J
HBW-1	0.0693 J	0.0368 J	0.0342 J
HBW-7	0.0772 J	< 0.05 U	0.0338 J
HBW-10	0.0565 J	< 0.05 U	0.0306 J

U – non-detect

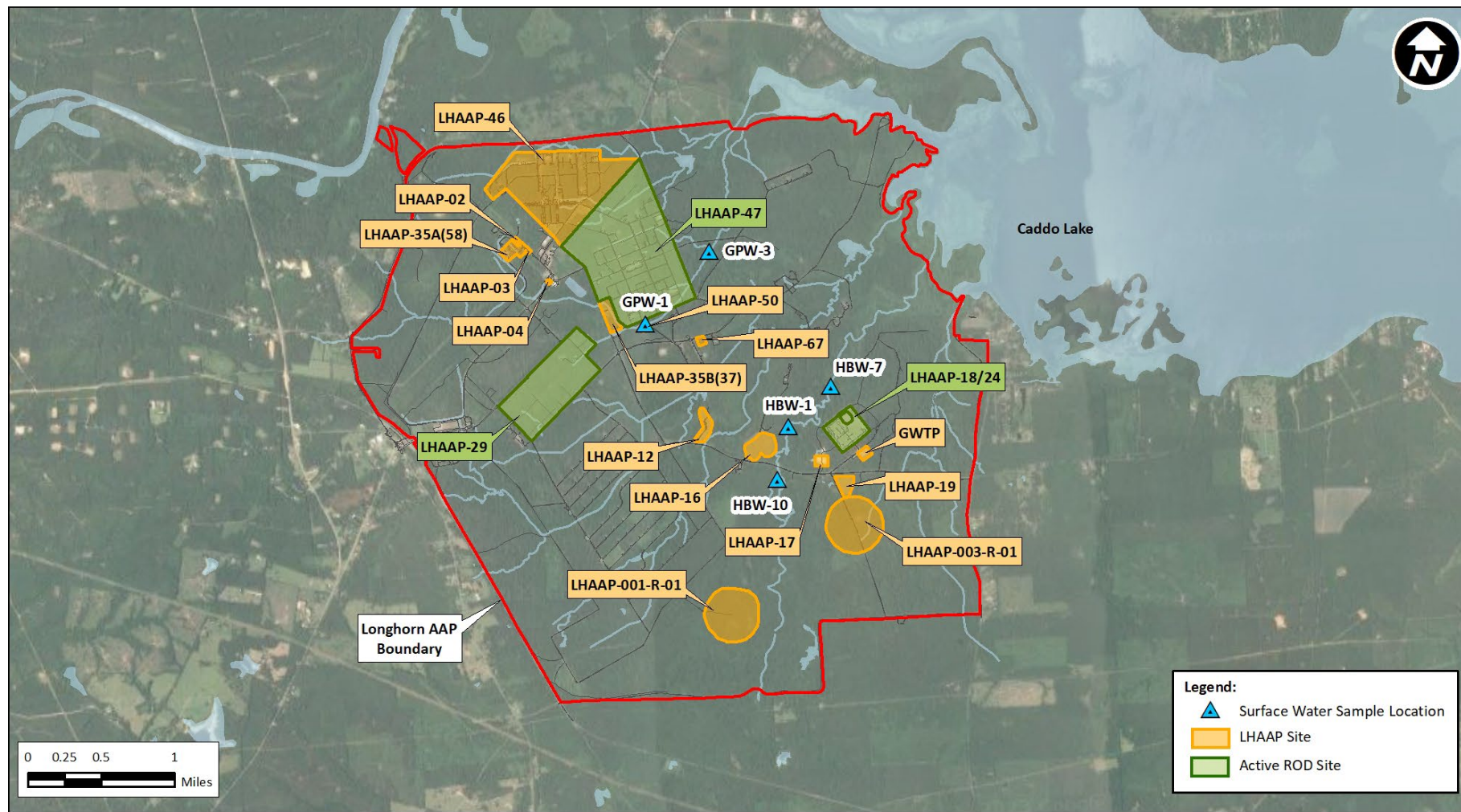
J – Estimated

Dry – no surface water



Note: GPW – Goose Prairie Creek sample location; HBW – Harrison Bayou sample location; GW Res – Groundwater residential limit; PCL – Protective Concentration Level; µg/L – micrograms per liter. 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 (estimated result) µg/L. No surface water sampling was conducted in the 3rd Quarter 2023 due to dry conditions.

Longhorn Army Ammunition Plant Creek Sampling Locations



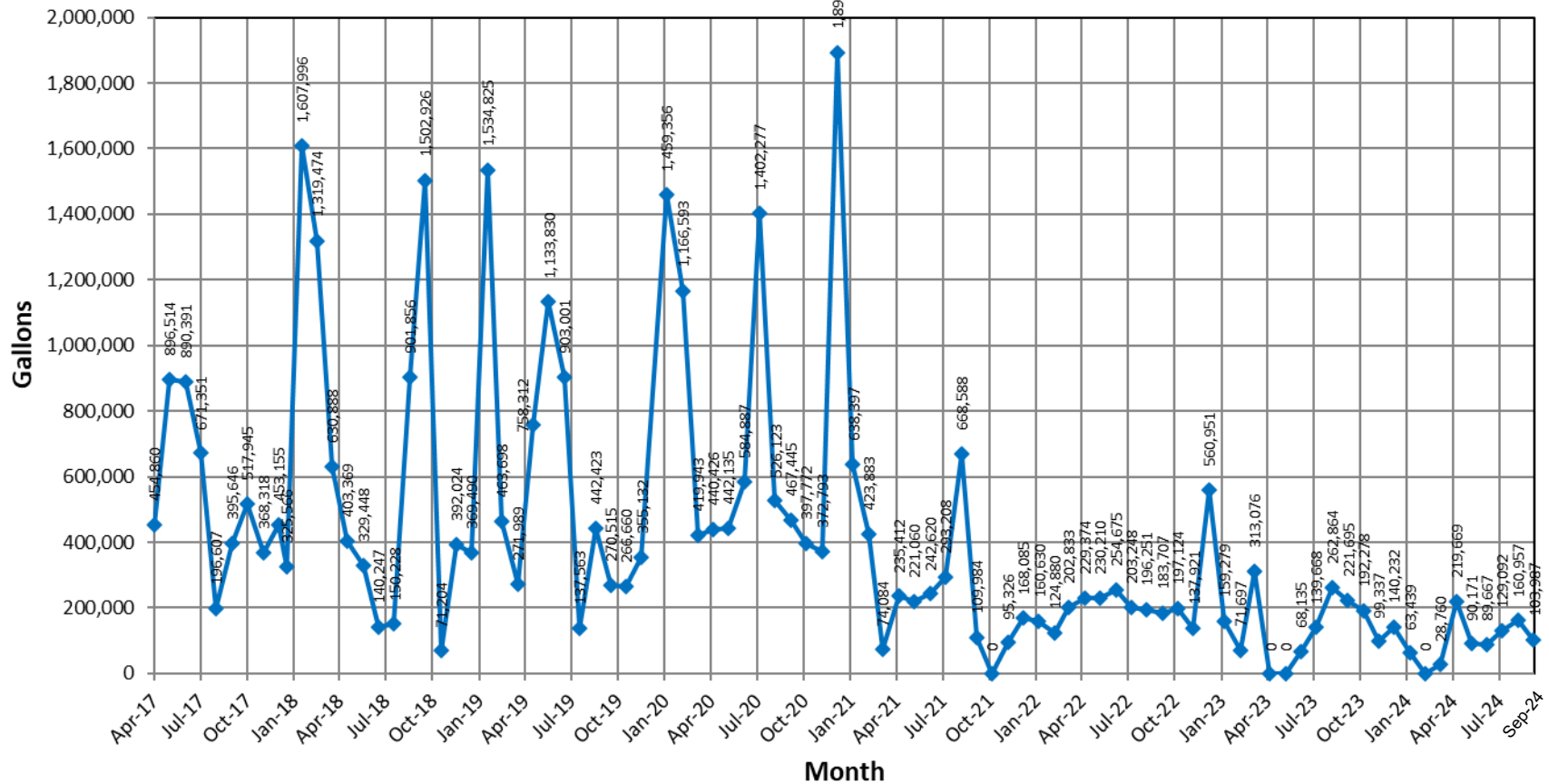
Groundwater Treatment Plant - Processed Groundwater Volumes

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

Processed Water Data (in gallons)

Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
454,860	896,514	890,391	528,538	195,198	961,324	517,945	368,318	453,155	325,566	1,607,996	1,319,474
Apr-18	May-18	Jun-18	Jul - 18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19
630,888	403,369	329,448	140,247	150,228	901,856	1,502,926	71,204	392,024	369,490	1,534,825	463,698
Apr-19	May-19	Jun-19	Jul - 19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
271,989	758,312	1,133,830	1,415,203	493,063	442,423	270,515	288,683	355,132	1,459,356	1,166,593	419,943
Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21
440,426	442,135	584,887	1,402,277	539,526	467,445	397,772	372,793	1,832,274	638,397	423,883	74,084
Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
235,412	1,121,060	242,620	293,208	668,588	109,984	0	95,326	439,585	322,130	124,880	202,833
Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23
229,374	230,210	254,675	203,248	196,251	183,707	197,124	137,921	560,951	159,279	71,697	313,076
Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
0	0	68,135	110,535	262,864	221,695	192,278	99,337	140,232	63,439	0	28,760
Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24						
219,669	90,171	89,667	129,092	160,957	103,987						

Treated Groundwater Discharged Monthly from April 2017 through September 2024



Notes:

No groundwater discharged in October 2021 due to a power disruption to the GWTP.

No groundwater discharged in April-May 2023 during contract transition.

No groundwater discharged in February 2024 due to freezing temperatures.

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
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
Dec-19	318,248	0	36,884	0	0
Jan-20	1,459,396	0	0	1,115,183	0

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
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
Nov-22	0	0	137,921	0	0
Dec-22	560,951	0	0	514,515	0

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
Jan-23	159,279	0	0	145,321	0
Feb-23	71,697	0	0	71,697	0
Mar-23	313,076	0	0	313,076	0
Apr-23	0	0	0	0	0
May-23	0	0	0	0	0
June-23	68,135	0	0	0	0
July-23	29,133	0	110,535	0	0
Aug-23	0	0	262,864	0	0
Sept-23	0	0	221,695	0	0
Oct-23	0	0	192,278	0	0
Nov-23	0	0	99,337	0	0
Dec-23	0	0	140,232	0	0
Jan-24	187,463	0	63,439	175,500	0
Feb-24	0	0	0	0	0
Mar-24	28,760	0	0	0	0
Apr-24	219,669	0	0	0	0
May-24	90,171	0	0	0	0
Jun-24	89,667	0	0	0	0
Jul-24	129,092	0	0	0	0
Aug-24	160,957	0	0	0	0
Sept-24	103,987	0	0	0	0

Notes: GWTP – Groundwater Treatment Plant; INF - Intermediate-Range Nuclear Force

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Longhorn Army Ammunition Plant (LHAAP)

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LHAAP-04 (Former Pilot Wastewater Treatment Plant)

- Contaminants of Concern (COCs): Perchlorate in Groundwater
- Prior Remedial Activities: Excavation, In-Situ Enhanced Bioremediation (ISB)
- Current Remedial Activities: Post-ISB Groundwater monitoring

LHAAP-12 (Landfill 12)

- COCs: Trichloroethene (TCE) in Groundwater
- Prior Remedial Activities: Land Use Controls (LUCs) and monitored natural attenuation (MNA)
- Current Remedial Activities: MNA (sampling and reporting), Long-Term Monitoring (LTM) for groundwater, LUC documentation and reporting

LHAAP-16 (Old Landfill)

- COCs: TCE, cis-1,2-dichloroethene (DCE), Vinyl Chloride (VC), and Perchlorate in Groundwater
- Prior Remedial Activities: ISB, Groundwater extraction
- Current Remedial Activities: Post-ISB Groundwater monitoring

LHAAP-35B (37) (Former Chemical Laboratory)

- COCs: 1,1-DCE, TCE, and Tetrachloroethylene (PCE) in Groundwater
- Prior Remedial Activities: Enhanced ISB
- Current Remedial Activities: LUC documentation and reporting and MNA (sampling and reporting)

LHAAP-46 (Plant 2 Area)

- COCs: TCE, cis-1,2-DCE, and VC in Groundwater
- Prior Remedial Activities: LUCs and MNA
- Current Remedial Activities: LUC documentation and reporting and MNA (sampling and reporting)

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LHAAP-50 (Former Sump Water Tank)

- COCs: Perchlorate, PCE, TCE, 1,1-DCE, 1,2-Dichloroethane (DCA), cis-1,2-DCE, and VC in Groundwater
- Prior Remedial Activities: MNA, Excavation, ISB
- Current Remedial Activities: Post-ISB Groundwater monitoring

LHAAP-35A (58) (Shops Area)

- COCs: PCE, 1,1-DCE, TCE, and VC in Groundwater
- Prior Remedial Activities: Enhanced ISB
- Current Remedial Activities: MNA (sampling and reporting) and LUC documentation and reporting

LHAAP-67 (Former Aboveground Storage Tank Farm)

- COCs: 1,1-DCE, 1,2-DCA, 1,1,1-trichloroethane (TCA), 1,1,2,-TCA, and TCE in Groundwater
- Prior Remedial Activities: MNA and LUCs
- Current Remedial Activities: MNA (sampling and reporting) and LUC documentation and reporting

LHAAP-001-R-01/-003-R-01 (Site 27, South Test Area, Bomb Test Area/ Site 54, Ground Signal Test Area)

- COCs: None
- Prior Remedial Activities: Removal of surface munition and explosives of concern
- Current Remedial Activities: Limited groundwater monitoring and LUCs

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Longhorn Army Ammunition Plant (LHAAP)

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LHAAP-18/24 (Burning Ground No. 3 / Unlined Evaporation Pond)

- COCs: Methylene Chloride (MC), TCE, cis-1,2-DCE, PCE, Benzene, 1,1,2-TCA, VC, Bromodichloromethane, 1,3,5-trinitrobenzene (TNB), 1,4-dioxane, arsenic, barium, chromium, cobalt, nickel, and perchlorate in Groundwater; TCE, MC, and PCE in Soil
- Prior Remedial Activities: Excavation
- Final Remedial Design submitted 1 March 2024
- Interim Remedy: Groundwater Treatment Plant operation from 1996 to current
- Selected Remedy: Groundwater extraction and treatment, Enhanced ISB, In-Situ Thermal Desorption (ISTD) of Dense Non-aqueous Phase Liquid (DNAPL), Maintenance of the Unlined Evaporative Pond (UEP) cap, Excavation and off-site disposal, MNA, LTM, and LUCs

LHAAP-29 (Former TNT Production Area)

- COCs: TCE, 1,2-DCA, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, MC, VC, 2,4-dinitrotoluene (DNT), 4-nitrotoluene (NT), 2-NT, 3-NT, arsenic, mercury, selenium, nickel, and perchlorate in Groundwater; 2,4,6-trinitrotoluene (TNT), 2,4-DNT, 2,6-DNT, and perchlorate in Soil; 1,3-dinitrobenzene (DNB), 2,4,6-TNT, 2,4-DNT, 2-amino-4,6-DNT, and 4-amino-2,6-DNT in Transite TNT Wastewater Line and Cooling Water Drain Line.
- Prior Remedial Activities: None
- Final Remedial Design submitted 29 February 2024
- Selected Remedy: Flush, inspect, and plug TNT wastewater and cooling water lines, Excavation and off-site disposal, ISTD, MNA, and LUCs

LHAAP-47 (Plant 3 Area)

- COCs: Perchlorate, TCE, cis-1,2-DCE, VC, 1,1-DCE, PCE, 1,2-DCA, acetone, chloroform, trans-1,2-DCE, 2,4,6-TNT, 2,4-DNT, 2,6-DNT, bis(2-ethylhexyl) phthalate, pentachlorophenol, aluminum, antimony, arsenic, cadmium, chromium, cobalt, manganese, nickel, silver, strontium, thallium, tin, and vanadium in Groundwater; Perchlorate and TCE in Soil
- Prior Remedial Activities: Plastic Liner to prevent migration in soil
- Current Remedial Activities: LUCs, Excavation, ISTD, Enhanced ISB, Biobarriers (permeable reactive barrier), and MNA

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LHAAP-17 (Burning Ground No. 2 / Flashing Area)

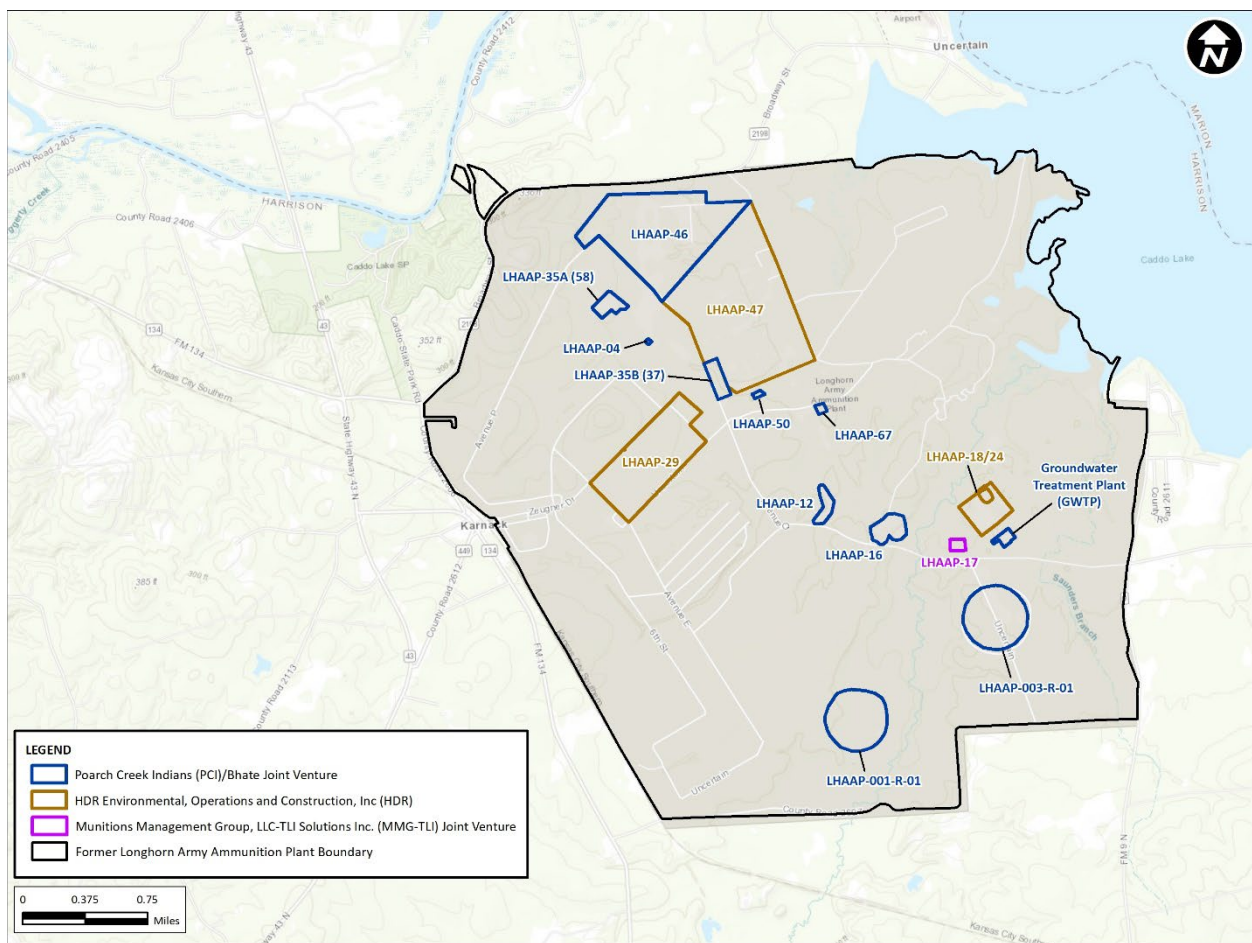
- COCs: Perchlorate, TCE, 1,1-DCE, 1,1-DCA, 1,2-DCA, and VC in Groundwater; Perchlorate, 2,4,6-TNT, 2,4-DNT, and 2,6-DNT in Soil
- Prior Remedial Activities: Excavation
- Current Remedial Activities: Groundwater Extraction and Performance Monitoring

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Longhorn Army Ammunition Plant (LHAAP)

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LHAAP SITE MAP



Fact Sheet: Active Sites

Longhorn Army Ammunition Plant (LHAAP)

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Definitions

In Situ Bioremediation (ISB) of Groundwater - Bioremediation is an engineered technology that modifies environmental conditions (physical, chemical, biochemical, or microbiological) to encourage microorganisms to destroy or detoxify organic and inorganic contaminants in the environment. The process can be applied above ground in land farms, tanks, biopiles, or other treatment systems (referred to as ex situ) or below ground in the soil or groundwater, referred to as in situ.

More info at [Community Guide to Bioremediation \(epa.gov\)](https://www.epa.gov/bioremediation/community-guide-to-bioremediation)

In situ thermal desorption (ISTD) is an intensive thermally enhanced environmental remediation technology that uses thermal conductive heating (TCH) elements to directly transfer heat to environmental media. The ISTD/TCH process can be applied at low (<100 °C), moderate (~100 °C) and higher (>100 °C) temperature levels to accomplish the remediation of a wide variety of contaminants, both above and below the water table. ISTD/TCH is the only major in situ thermal remediation (ISTR) technology capable of achieving subsurface target treatment temperatures above the boiling point of water and is effective at virtually any depth in almost any media. TCH works in tight soils, clay layers, and soils with wide heterogeneity in permeability or moisture content that are impacted by a broad range of volatile and semi-volatile organic contaminants.

More info at [Community Guide to In Situ Thermal Treatment \(epa.gov\)](https://www.epa.gov/thermal-treatment/community-guide-to-in-situ-thermal-treatment)

Natural attenuation relies on natural processes to decrease or “attenuate” concentrations of contaminants in soil and groundwater. Monitoring typically involves collecting soil and groundwater samples to analyze them for the presence of contaminants and other site characteristics. The entire process is called “monitored natural attenuation” or “MNA.” Natural attenuation occurs at most contaminated sites. However, the right conditions must exist underground to clean sites properly and quickly enough. Regular monitoring must be conducted to ensure that MNA continues to work.

More info at [Community Guide to Monitored Natural Attenuation \(epa.gov\)](https://www.epa.gov/monitored-natural-attenuation/community-guide-to-monitored-natural-attenuation)

Groundwater extraction and treatment or pump and treat is a common method for cleaning up groundwater contaminated with dissolved chemicals, including industrial solvents, metals, and fuel oil. Groundwater is pumped from wells to an above-ground treatment system that removes the contaminants. Pump and treat methods may involve installing one or more wells to extract the contaminated groundwater. Groundwater is pumped from these “extraction wells” to the ground surface, either directly into a treatment system or into a holding tank until treatment can begin. The treatment system may consist of a single cleanup method, such as activated carbon or air stripping, to clean the water. However, treatment often requires several cleanup methods if the groundwater contains different types of contaminants or high concentrations of a single contaminant. The approach to treatment may be modified as contaminant concentrations decrease

Fact Sheet: Active Sites

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More info at [Community Guide to Pump and Treat \(epa.gov\)](https://www.epa.gov/community-guide-to-pump-and-treat)

Bioremediation is the use of microbes to clean up contaminated soil and groundwater. Microbes are very small organisms, such as bacteria, that live naturally in the environment. Bioremediation stimulates the growth of certain microbes that use contaminants as a source of food and energy. Contaminants treated using bioremediation include oil and other petroleum products, solvents and pesticides.

More info at [Community Guide to Bioremediation \(epa.gov\)](https://www.epa.gov/community-guide-to-bioremediation)

Air stripping is the process of moving air through contaminated water in an aboveground treatment system to remove chemicals called “volatile organic compounds” or “VOCs.” VOCs are chemicals that easily evaporate, which means they can change from a liquid to a vapor (a gas). The air passed through contaminated water helps evaporate VOCs faster. The chemical vapors are collected, and either treated or vented outside if VOC levels are low enough. Air stripping is commonly used to treat groundwater as part of the pump and treat cleanup method.

More info at [Community Guide to Air Stripping \(epa.gov\)](https://www.epa.gov/community-guide-to-air-stripping)

A permeable reactive barrier, or “PRB,” is a wall created below ground to clean up contaminated groundwater. The wall is “permeable,” which means that groundwater can flow through it. Water must flow through the PRB to be treated. The “reactive” materials that make up the wall either trap harmful contaminants or make them less harmful. The treated groundwater flows out the other side of the wall.

More info at [Community Guide to Permeable Reactive Barriers \(epa.gov\)](https://www.epa.gov/community-guide-to-permeable-reactive-barriers)

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Acronyms and Abbreviations

COC	Contaminant of Concern
DCA	Dichloroethane
DCE	Dichloroethene
DNAPL	Dense Non-aqueous Phase Liquid
DNB	Dinitrobenzene
DNT	Dinitrotoluene
ISB	In-Situ Bioremediation
ISTD	In-Situ Thermal Desorption
LHAAP	Longhorn Army Ammunition Plant
LTM	Long Term Monitoring
LUC	Land Use Control
MC	Methylene Chloride
MNA	Monitored Natural Attenuation
NT	Nitrotoluene
PCE	Tetrachloroethene
TCA	Trichloroethane
TCE	Trichloroethene
TNB	Trinitrobenzene
TNT	Trinitrotoluene
UEP	Unlined Evaporative Pond
VC	Vinyl Chloride