



LONGHORN ARMY AMMUNITION PLANT
RESTORATION ADVISORY BOARD
Karnack, Texas
(726) 999-0505

28 May 2024

Dear LHAAP RAB Member,

The next Restoration Advisory Board (RAB) meeting for the former Longhorn Army Ammunition Plant (LHAAP) will be held on **Thursday, June 27, 2024, from 6:00 to 7:00 p.m.** at the Karnack Community Center, Karnack, Texas. The tentative agenda for the meeting is attached to this letter.

Poarch Creek Indians, Governmental Services, LLC / Bhate Environmental Associates, Inc. (PCI/Bhate) Joint Venture is the contractor supporting the U.S. Army environmental restoration activities at the former LHAAP and will be coordinating the RAB meeting. If you have additional items for the agenda, please provide to me at lena.j.sierocinski.civ@army.mil.

Regards,

Lena Sierocinski
LHAAP Environmental Support Manager
U.S. Army Environmental Command

Copy to:
Laura-Ashley Overdyke, CLI (TAG)
Janetta Coats; EPA (Region 6 TAG Coordinator/Project Officer and Community Involvement Coordinator)



AGENDA

DATE: Thursday, June 27, 2024
TIME: 6:00 – 7:00 PM
PLACE: Karnack Community Center, Karnack, Texas

6:00 Welcome and Introduction

6:05 Open Items

- Ongoing Outreach/Website
- RAB Administrative Issues
 - o Membership Update
 - o Minutes (November 2023 RAB Meeting)

6:10 Defense Environmental Restoration Program (DERP) Update

- Groundwater Treatment Plant Update

6:25 Other Defense Environmental Restoration Program (DERP) Update

- LHAAP-17 Status
- LHAAP-18/24 Remedial Design
- LHAAP-29 Remedial Design
- LHAAP-47 Pre-Design Investigation Update

6:55 Next RAB Meeting Schedule and Closing Remarks



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

Location of Meeting: Caddo Lake State Park Group Hall

Date of Meeting: 27 June 2024, 6:00-7:04 PM Central Daylight Time (CDT)

Meeting Participants:

USACE: Aaron Williams
USAEC: Lena Sierocinski
PCI-Bhate JV: Zachary Beck and Michelle Schwartz
USEPA: Joel Reyes
HDR: Gregory Kelly
RAB: Present: Tom Walker, Eugene Byrd, Deon Hall, Richard LeTourneau, John Fortune, and Sharon McAvoy
Absent: Judy VanDeventer, Nigel Shivers, Donna Burney, Terry Britt, and Margaret Roland
Public: Laura-Ashley Overdyke (Executive Director of the Caddo Lake Institute)

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

Welcome and Introduction

Ms. Lena Sierocinski, with the United States Army Environmental Command (USAEC), called the RAB Meeting to order at 6:10 pm CST. Mr. Deon Hall seconded the motion to begin the RAB Meeting.

Opening Items

Ms. Sierocinski checked to make sure that all the RAB members were able to view the minutes from the previous RAB Meeting, in which the members responded “yes”. Mr. John Fortune made a motion to approve the November 2023 RAB Meeting minutes. Mr. Hall seconded the motion.

Ms. Sierocinski encouraged all attendees to join the RAB, which she explained can be done by completing the application found on the website, www.longhornaap.com. Ms. Sierocinski stated if there are any questions, she can be contacted via email to provide answers.

Ms. Sierocinski introduced a new handout given to the participants: a fact sheet that contains information about contaminants of concern (COCs) for each site and the history of all remedial activities conducted in the past at each site.

During the introduction, Ms. Laura-Ashley Overdyke, Executive Director of the Caddo Lake Institute, requested that the Administrative Record be updated with Ms. Sierocinski’s contact information and name on the website. Ms. Overdyke also requested that the fact sheet be uploaded to the Administrative Record.



Ms. Sierocinski discussed the frequency of in-person RAB Meetings, inquiring whether two meetings a year would be better for everyone's schedule compared to three annual meetings. Mr. Fortune stated that three meetings a year is preferred rather than two meetings a year.

Five-Year Review

Ms. Sierocinski gave a status update of the Five-Year Review Report, explaining that it is a method the government uses to evaluate whether remedial action objectives are being reached using current remedial activities. A list of all sites included in the Five-Year Review was displayed in the slide presentation.

Per- and Poly-Fluoroalkyl Substances

Ms. Sierocinski also provided an update on the Preliminary Assessment/Site Inspection for per- and poly-fluoroalkyl substances (PFAS) and the next steps to be taken. Ms. Sierocinski discussed the historical uses of fire-fighting foam as being the source of PFAS, among other potential sources. Mr. Fortune inquired whether "PFAS" was the same as "Teflon". Dr. Michelle Schwartz, with PCI-Bhate JV, clarified that PFAS was an umbrella term that contained several different chemicals, including the one used in Teflon, but that only a few PFAS chemicals are currently regulated under the United States Environmental Protection Agency (USEPA).

Groundwater Treatment Plant

Mr. Zachary Beck (PCI-Bhate JV) provided the Groundwater Treatment Plant (GWTP) update for November 2023 - June 2024 operational period. Mr. Beck explained the general layout of the GWTP, described the various treatment stages, and showed a video demonstrating the operation of a fluidized bed reactor (FBR). Mr. Fortune asked about the size of the FBR. Mr. Beck said that it was large, and Dr. Schwartz estimated that the tank solely was about 20 feet tall. Mr. Beck then stated that the GWTP was shut down between mid-January and March 2024 due to freeze damage. Mr. Tom Walker asked whether the low temperatures impacted the performance of the FBR. Mr. Beck explained that the FBR tank is insulated, so cold temperatures do not affect performance if the integrity of the piping is maintained. However, Mr. Beck did clarify that low temperatures could possibly slow down microbial activity if air was introduced into the system. Ms. Sierocinski added that the ion-exchange resin systems located after the FBR would be able to handle the contaminants if microbial activity was inhibited due to temperature. Mr. Beck then cited the necessary repairs for the GWTP and the anticipated ion exchange resin changeout planned for July 2024.

Mr. Beck presented a graph of the processed water discharged from the GWTP. He explained the INF pond stores the groundwater treated by the GWTP when it cannot be discharged to the Bayou due to insufficient flow. Ms. Sierocinski added that the lower flows in the system were tied to the age of the GWTP and that service work is being done for system maintenance.

Surface Water



Mr. Beck discussed the surface water samples collected and the analytical result trends. Mr. Greg Kelly from HDR asked whether the spikes in concentrations of perchlorate seen in 2019 and 2021-2022 were correlated to low flow. Mr. Beck explained that the surface water sample collected at HBW-7 on 11 July 2019 had a detection of 27 micrograms per liter ($\mu\text{g/L}$). Therefore, surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J (estimated result) $\mu\text{g/L}$. Mr. Beck explained that it was undetermined what caused the elevated perchlorate in July 2019, however, the second sample result demonstrated that there was no lasting impact on surface water. Mr. Beck further explained the spikes in concentration could be possibly due to a lab error caused by low flow. Mr. Kelly pointed out observations at such low concentrations do not require much of a detection to cause a spike on the graph. Mr. Walker asked about the horizontal line on the graph. Mr. Beck clarified that it was the protective concentration level (PCL) for perchlorate. Ms. Overdyke asked who establishes the PCL, and Ms. Sierocinski clarified that it is the TCEQ. Mr. Eugene Byrd asked about the collection points of surface water samples, so Mr. Beck showed a map depicting the locations of the samples.

LHAAP-17

Mr. Beck provided a brief historical overview of LHAAP-17. Mr. Beck presented the perchlorate trends for groundwater at LHAAP-17. Mr. Beck explained that water was being pumped from LHAAP-17 to the GWTP to reduce perchlorate concentrations sitewide to below 20,000 $\mu\text{g/L}$ before the site transitions to monitored natural attenuation. Ms. Sierocinski explained a time-critical removal action is occurring due to the presence of munitions and explosives of concern or otherwise known as “MEC”.

LHAAP 18/24

Mr. Kelly presented that the Final Remedial Design was completed and will be included in the 1st Quarter 2024 Administrative Record update. The selected remedy will utilize a combination of enhanced in-situ bioremediation, thermal treatment, maintenance of the unlined evaporative pond cap, soil excavation and off-site disposal, monitored natural attenuation, long-term monitoring, and land-use controls. Mr. Fortune asked for more information regarding thermal treatment. Mr. Kelly explained that the system does use electricity, but that he was not an expert on thermal treatment and was unable to provide a very detailed explanation of the treatment process.

Mr. Byrd asked for clarification on where excavated soils were disposed and how they were tracked. Mr. Kelly explained that waste generated from site remediation were tracked from “cradle to grave.” Where the soil ultimately was sent depended on its chemical characteristics, as it would dictate which type of landfill was required to properly dispose of the soil. All waste would be manifested following United States Department of Transportation policy.

LHAAP-47



Mr. Kelly described the status of the Remedial Design for LHAAP-47, explaining that additional shallow monitoring wells were to be installed and sampled to provide further data on the shallow groundwater contamination. Once sample results and pump tests are completed, this information will be used for consideration in the development of the Remedial Design.

Next RAB Meeting Schedule and Closing Remarks

Before adjourning, Ms. Overdyke asked about the significance of the “J” marker on the data surface water analytical table. Mr. Beck explained the “J” flag was used when a compound was detected above the method detection level but below the level of quantitation, so the number was an estimate. Ms. Sierocinski explained this happens when concentrations are so low that lab tests are unable to get a precise measurement of the concentration of a chemical.

The next RAB meeting was scheduled for 5:00 pm CST on 14 November 2024.

Adjourn

Mr. Walker motioned to adjourn the meeting at 7:04 pm CST.

June 2024 Meeting Attachments and Handouts:

- Meeting Agenda
- Color Copy of PCI-Bhate JV Presentation Slides
- Fact Sheet
- Validated Data Sheet



LONGHORN ARMY AMMUNITION PLANT (LHAAP)

Restoration Advisory Board Meeting

27 JUNE 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-17 Status
- LHAAP-18/24 Remedial Design
- LHAAP-29 Remedial Design
- LHAAP-47 Pre-Design Investigation Update

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).

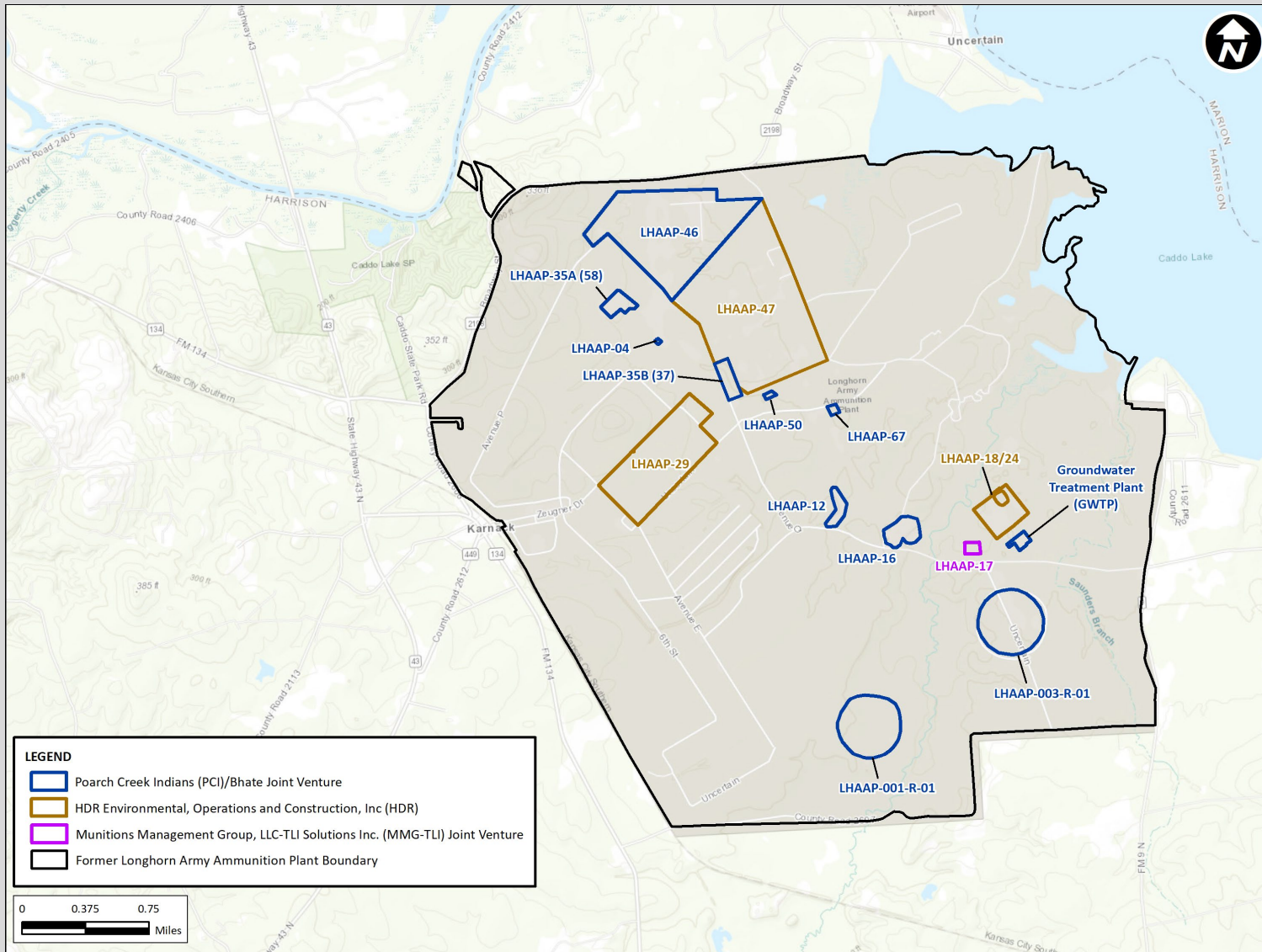
HDR Environmental, Operations and Construction, Inc (HDR)

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

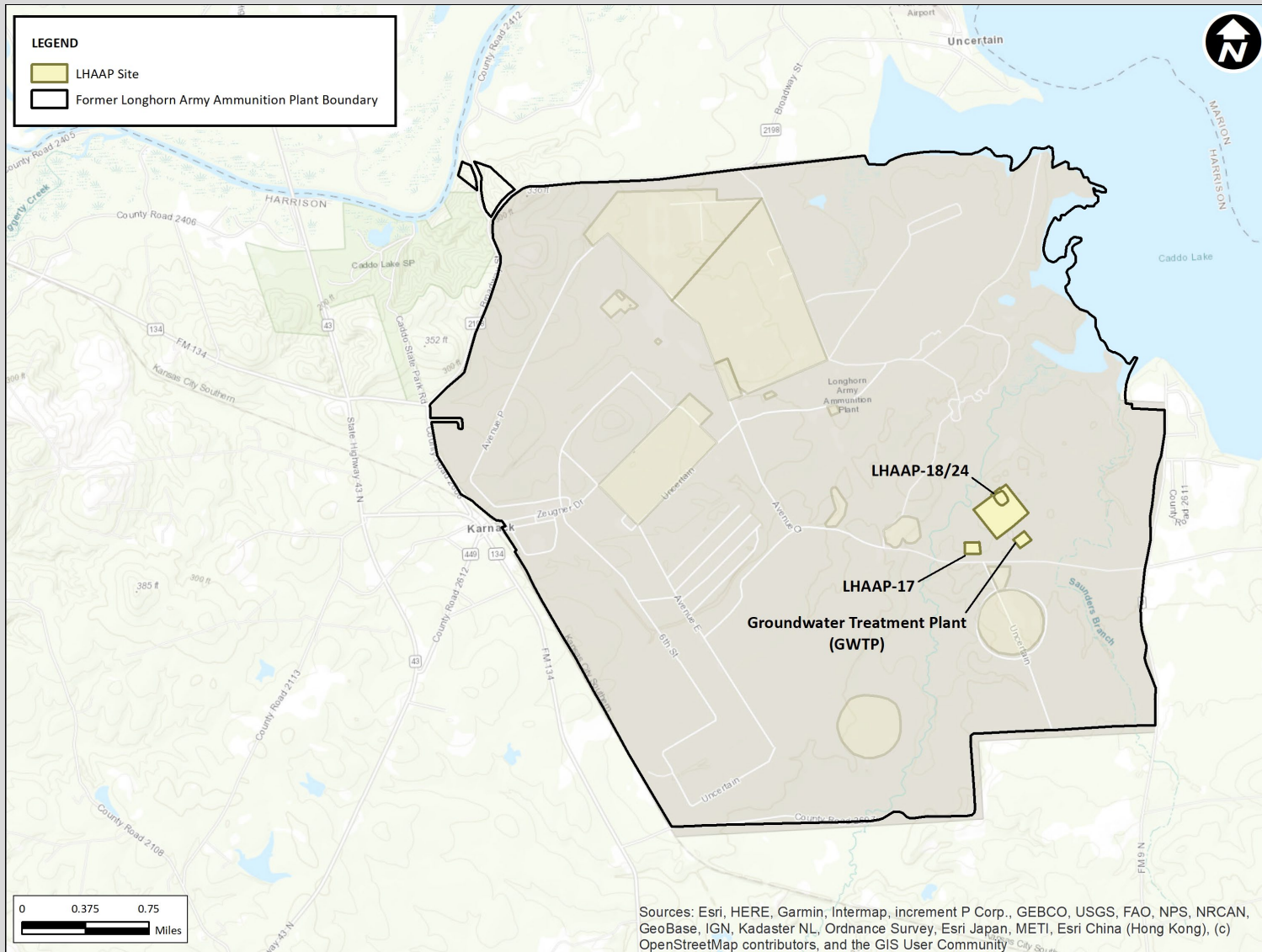
Munitions Management Group, LLC-TLI Solutions Inc. (MMG-TLI) Joint Venture:

- LHAAP-17.

LHAAP SITE MAP



GROUNDWATER TREATMENT PLANT UPDATE



GROUNDWATER TREATMENT PLANT UPDATE

Groundwater Treatment Plant (GWTP) Design

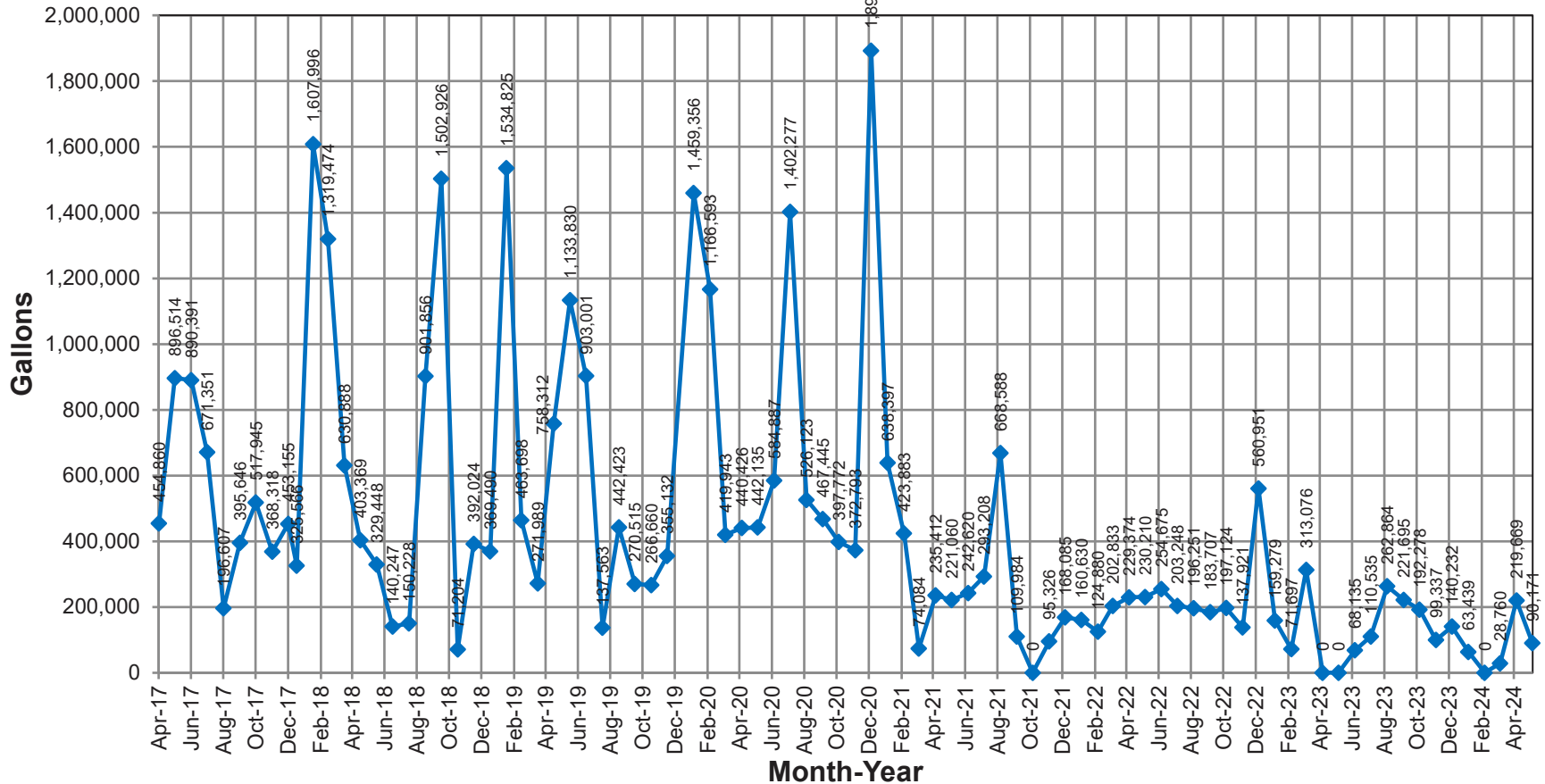
- Metals treatment system
- Volatile organics treated via an air stripper
- Perchlorate treated via a Fluidized Bed Reactor (FBR): [Envirogen FBR Video](#)
- Ion exchange system

GWTP Operations (November 2023 – June 2024):

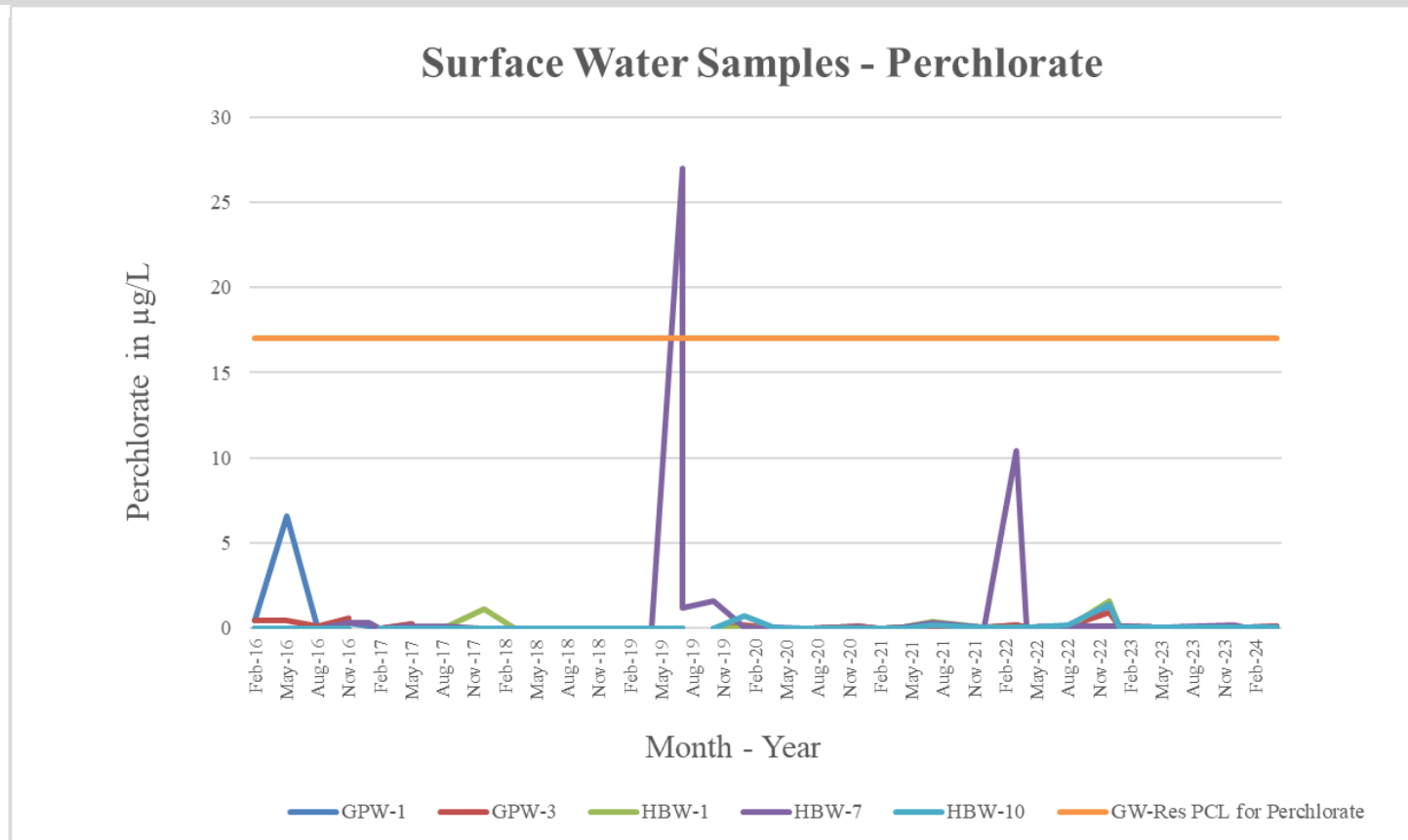
- November 2023 – Exterior LED lighting installed.
- Mid-January 2024 – February 2024 – GWTP shutdown due to freeze damage sustained on 16 January 2024.
- March 2024 – GWTP operations restarted after repairs were completed.
 - FBR (re)startup/evaluation
- – GWTP returned to full operation.
- June 2024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

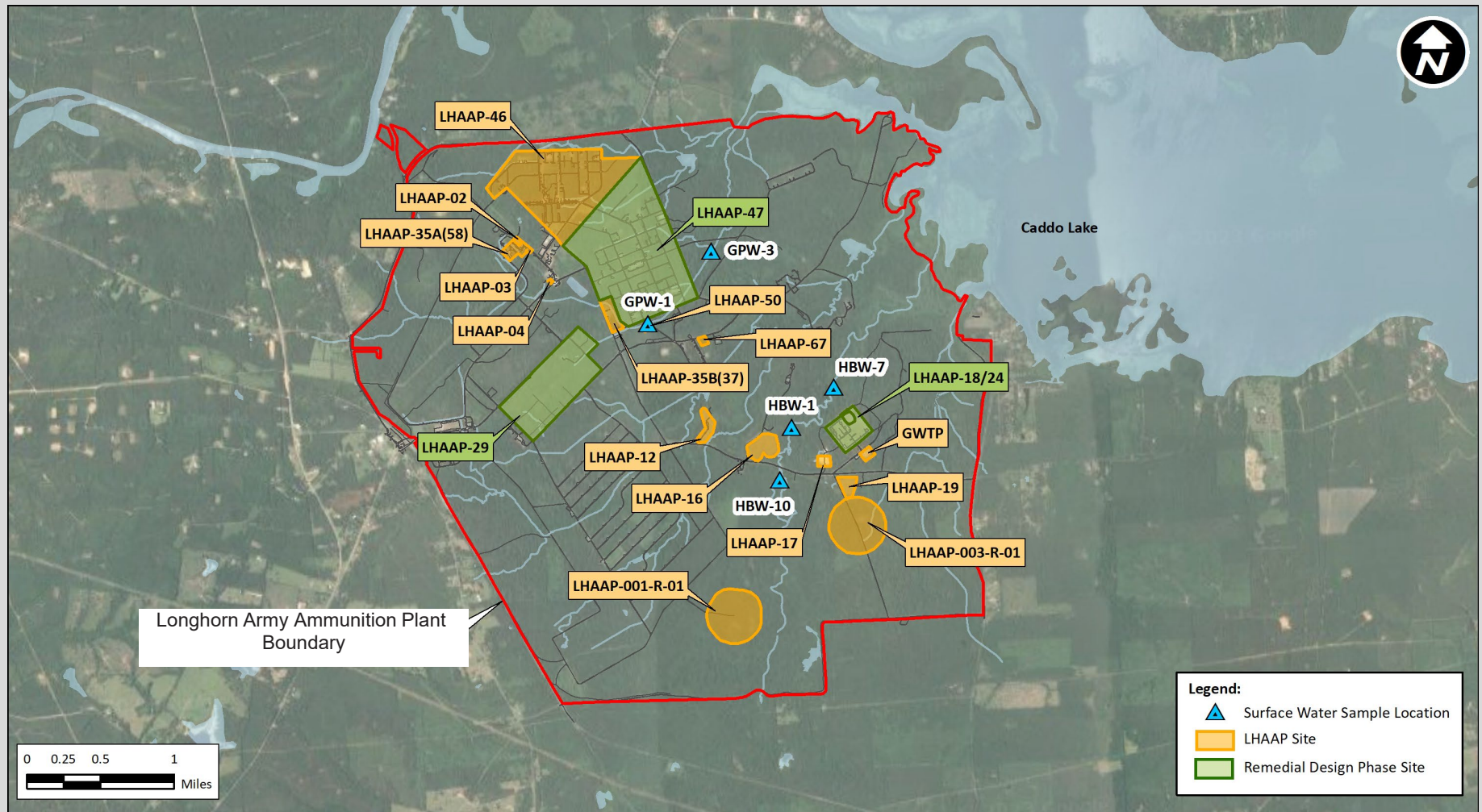


SURFACE WATER SAMPLE RESULTS



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



LEGEND

- LHAAP Site
- Former Longhorn Army Ammunition Plant Boundary

LHAAP-17

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

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:

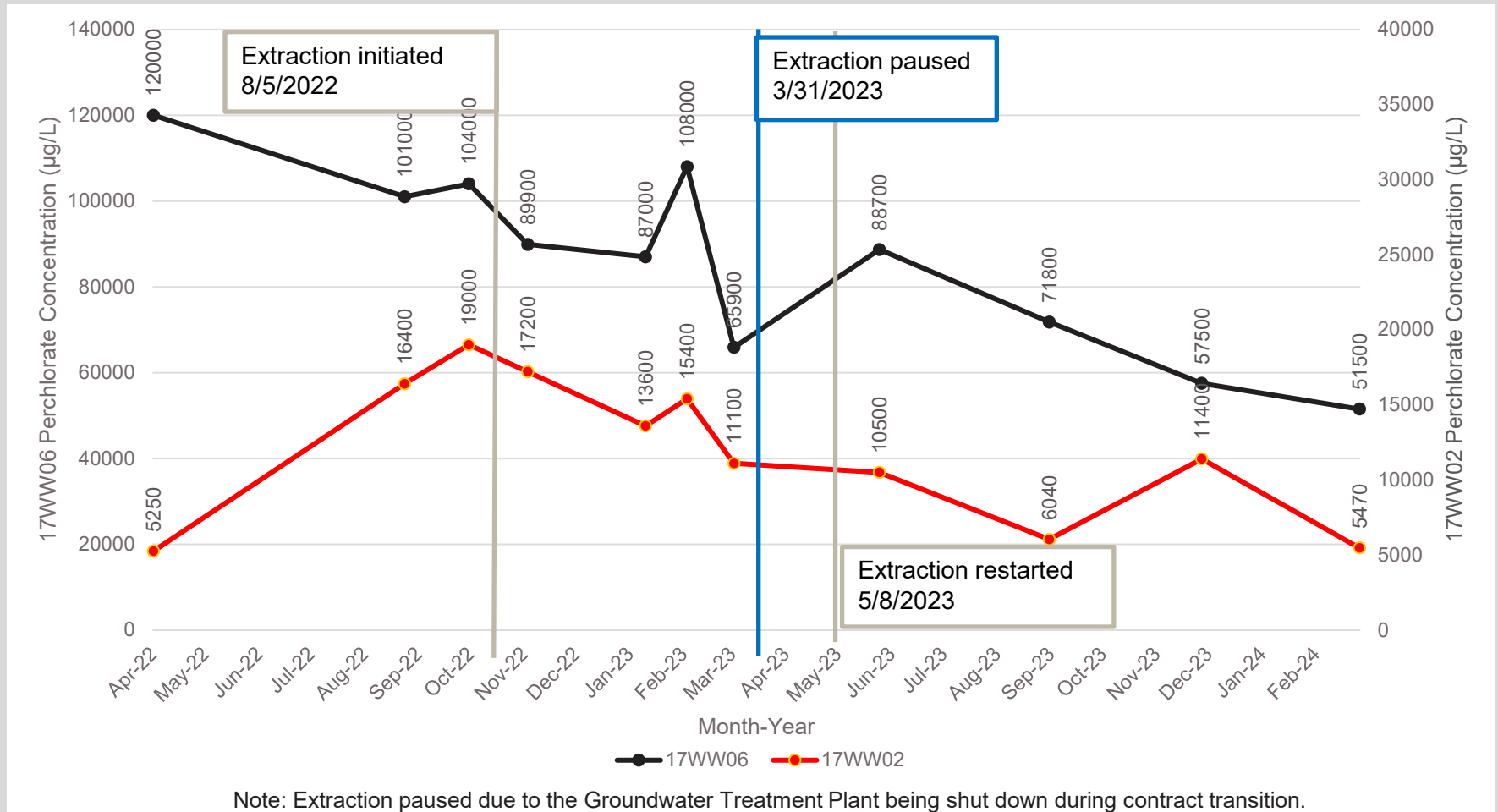
- Groundwater extraction system installation was completed in August 2022 and is operating per the design.
- Performance monitoring is ongoing.

LHAAP-17 PERFORMANCE MONITORING

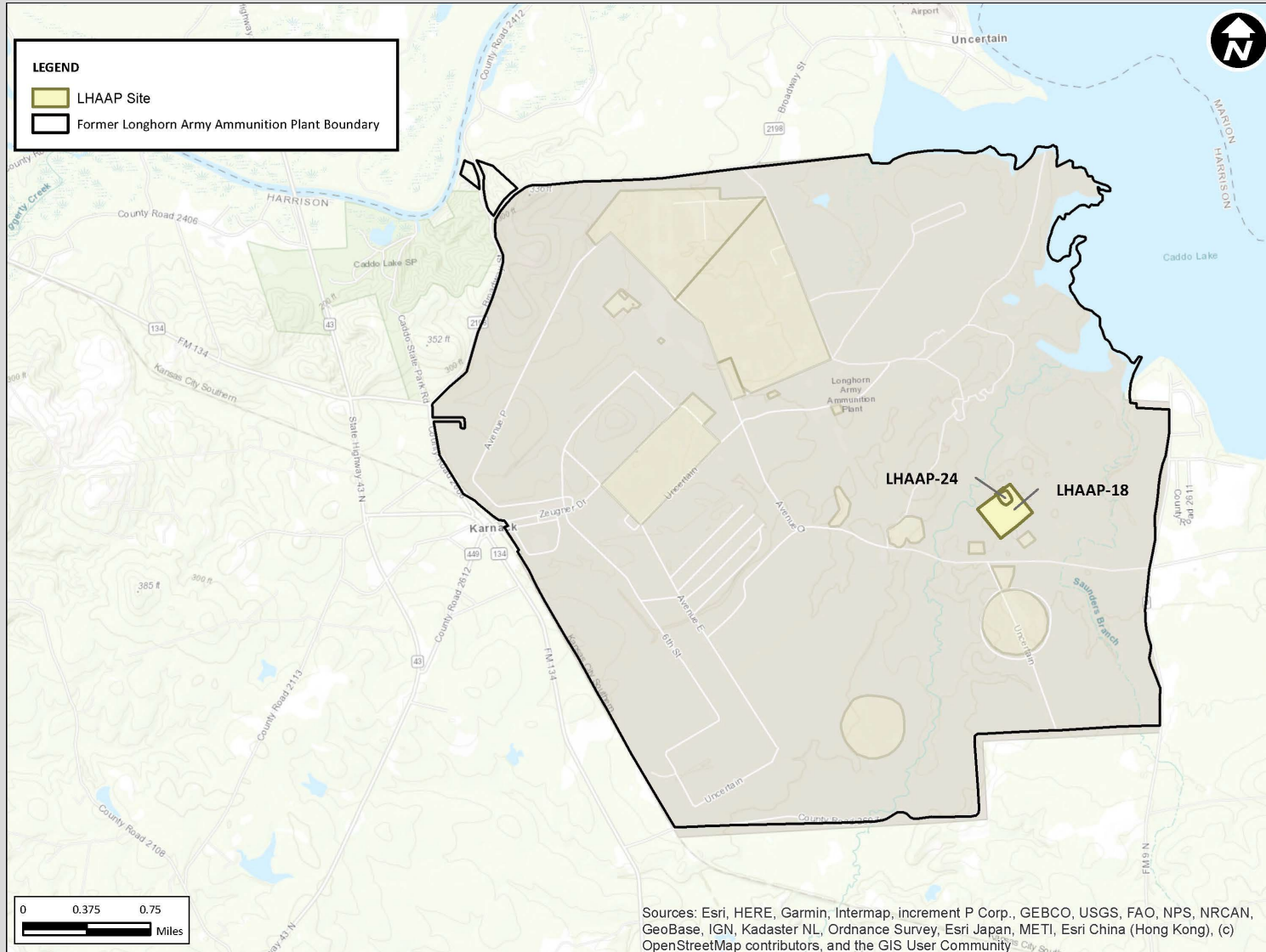
Performance Monitoring:

- The groundwater extraction remedial action objective is to reduce perchlorate concentrations sitewide below 20,000 micrograms per liter (µg/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 µg/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



LHAAP-18/24 UPDATE



LHAAP-18/24 REMEDIAL DESIGN UPDATE

Background

- LHAAP-18, Burning Ground No. 3, was used for waste disposal by burning, detonation and burial. Rocket motors, pyrotechnic and illumination devices were also manufactured.
- LHAAP-24, Unlined Evaporation Pond (UEP), was constructed in 1963 within LHAAP-18

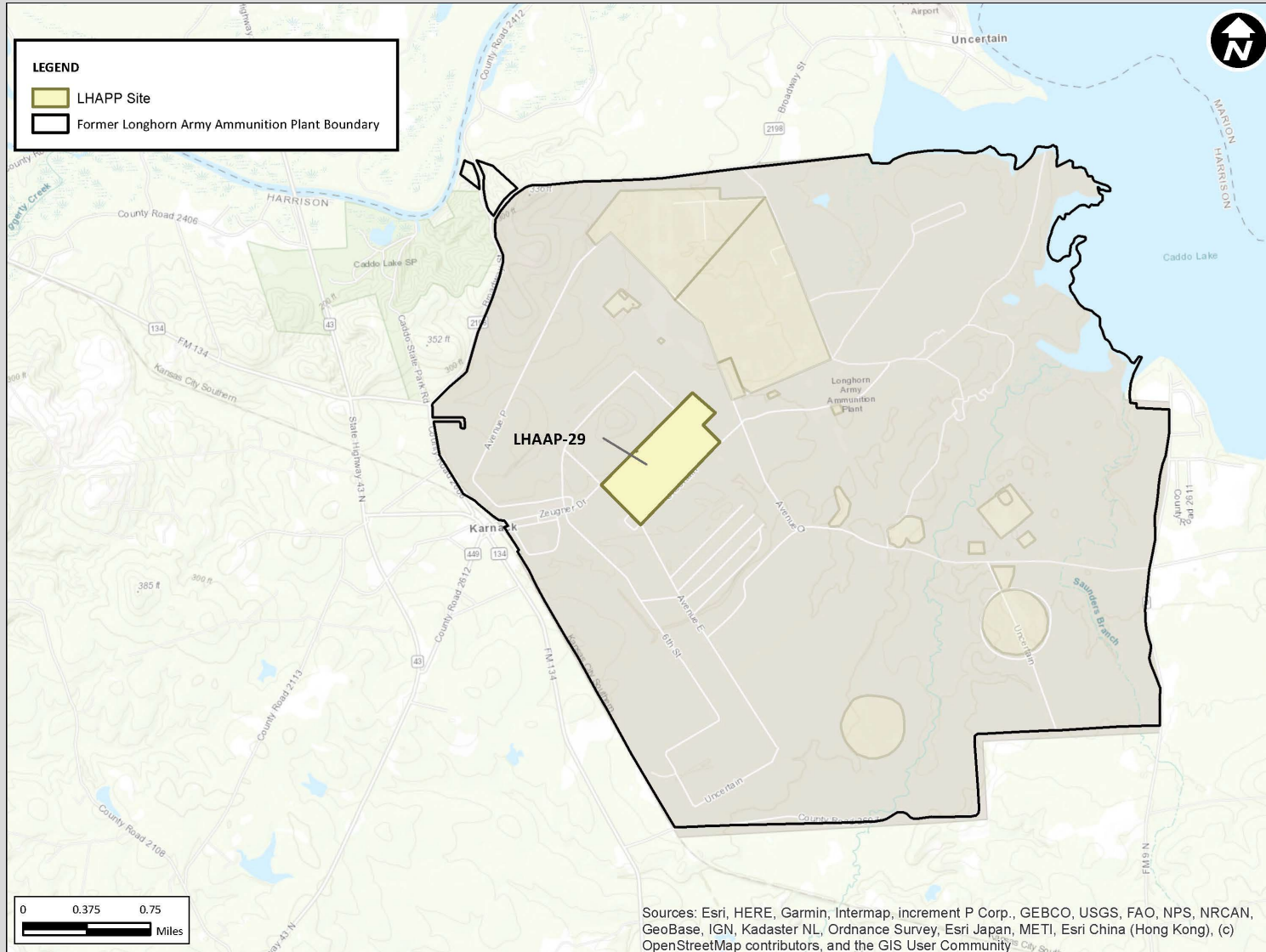
100% Remedial Design Complete

- Final Design was submitted 1 March 2024 and will be included in the 1st Quarter 2024 Administrative Record update.

Selected Remedy

- To be placed on contract in FY25
- Enhancement of the groundwater extraction and treatment system.
- Enhanced In-Situ Bioremediation (EISB) in Shallow Zone groundwater and Wilcox Formation groundwater both inside and outside the containment area.
- Thermal treatment to remove Dense Non-aqueous Phase Liquid (DNAPL).
- Maintenance of the Unlined Evaporative Pond (UEP) cap.
- Unsaturated soil excavation and off-site disposal.
- Monitored Natural Attenuation (MNA).
- Long-Term Monitoring (LTM) and Land Use Controls.

LHAAP-29 UPDATE



LHAAP-29 REMEDIAL DESIGN UPDATE

Background

LHAAP-29 was a former trinitrotoluene (TNT) production area operational from April 1943 to August 1945 as a six-line plant with a supporting acid plant. The plant produced 180 million kilograms of TNT throughout the period of operation.

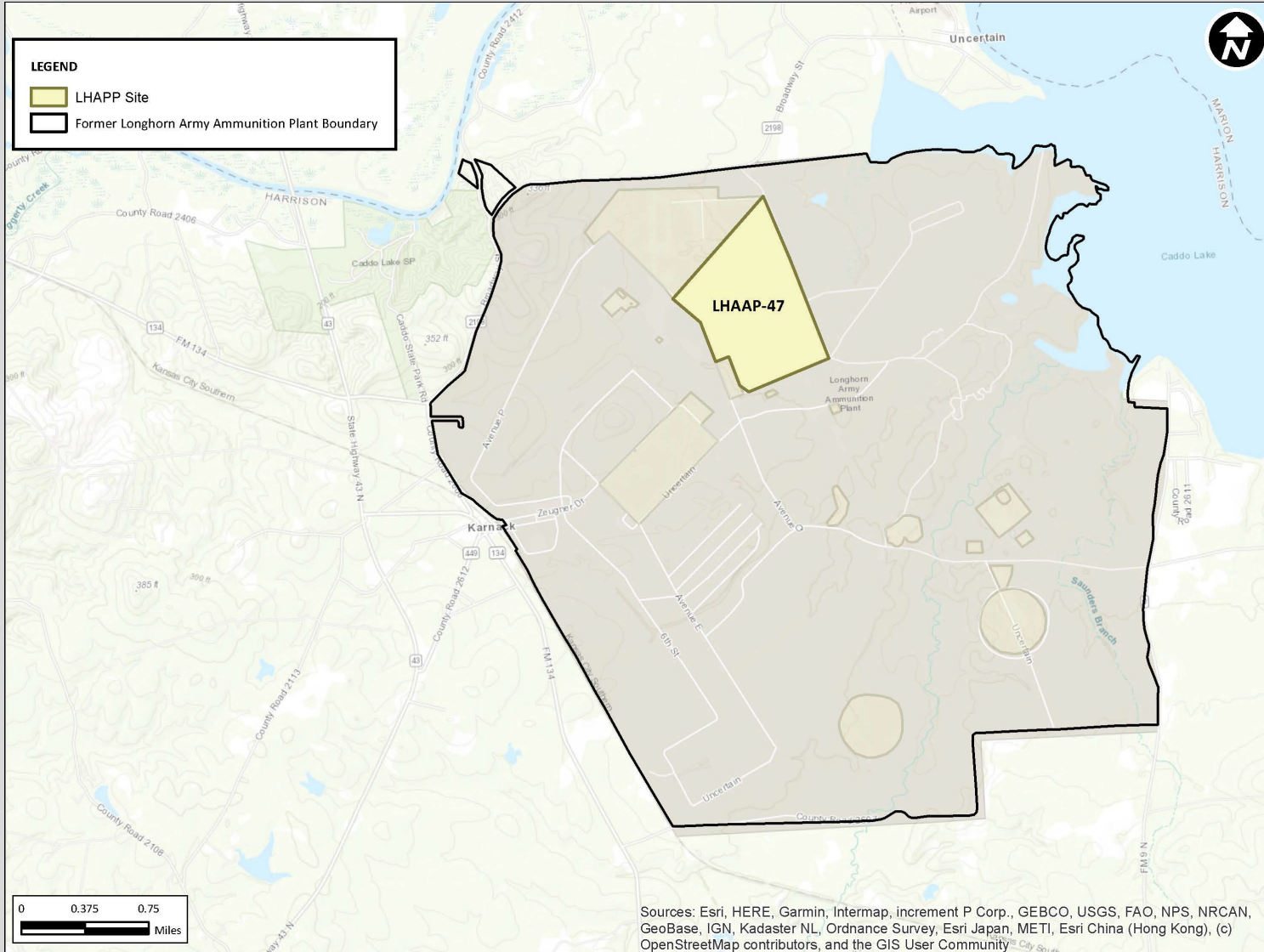
100% Remedial Design Complete

- Final Design was submitted 29 February 2024 and will be included in the 1st Quarter 2024 Administrative Record update.

Selected Remedy

- To be placed on contract in FY25
- Flush, inspect, and plug the 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 (DNAPL) plume.
- Monitored Natural Attenuation (MNA) in the shallow groundwater zone plumes and for the intermediate groundwater plume following ISTD.
- Land Use Controls for soil and groundwater.

LHAAP-47 UPDATE



LHAAP-47 REMEDIAL DESIGN UPDATE

Background

LHAAP-47 was used to manufacture rocket motors, pyrotechnic and illumination devices.

Selected Remedy

- Soil excavation and off-site disposal.
- Thermal treatment of groundwater.
- Bioremediation.
- Monitored Natural Attenuation.
- Land Use Controls to maintain the remedy and prohibit groundwater use.

Pre-Design Investigation (PDI) Status

- Primary purpose of the PDI is to support development of the Remedial Design.
- Field work was performed during May and June 2023.
- 6 new monitoring wells were installed during May 2023.
- 56 monitoring wells were sampled and analyzed for volatile organic compounds, perchlorate, and metals.
- Draft Final PDI Report was approved by Texas Commission on Environmental Quality (TCEQ) and Environmental Protection Agency (EPA) in early 2024.

LHAAP-47 REMEDIAL DESIGN UPDATE

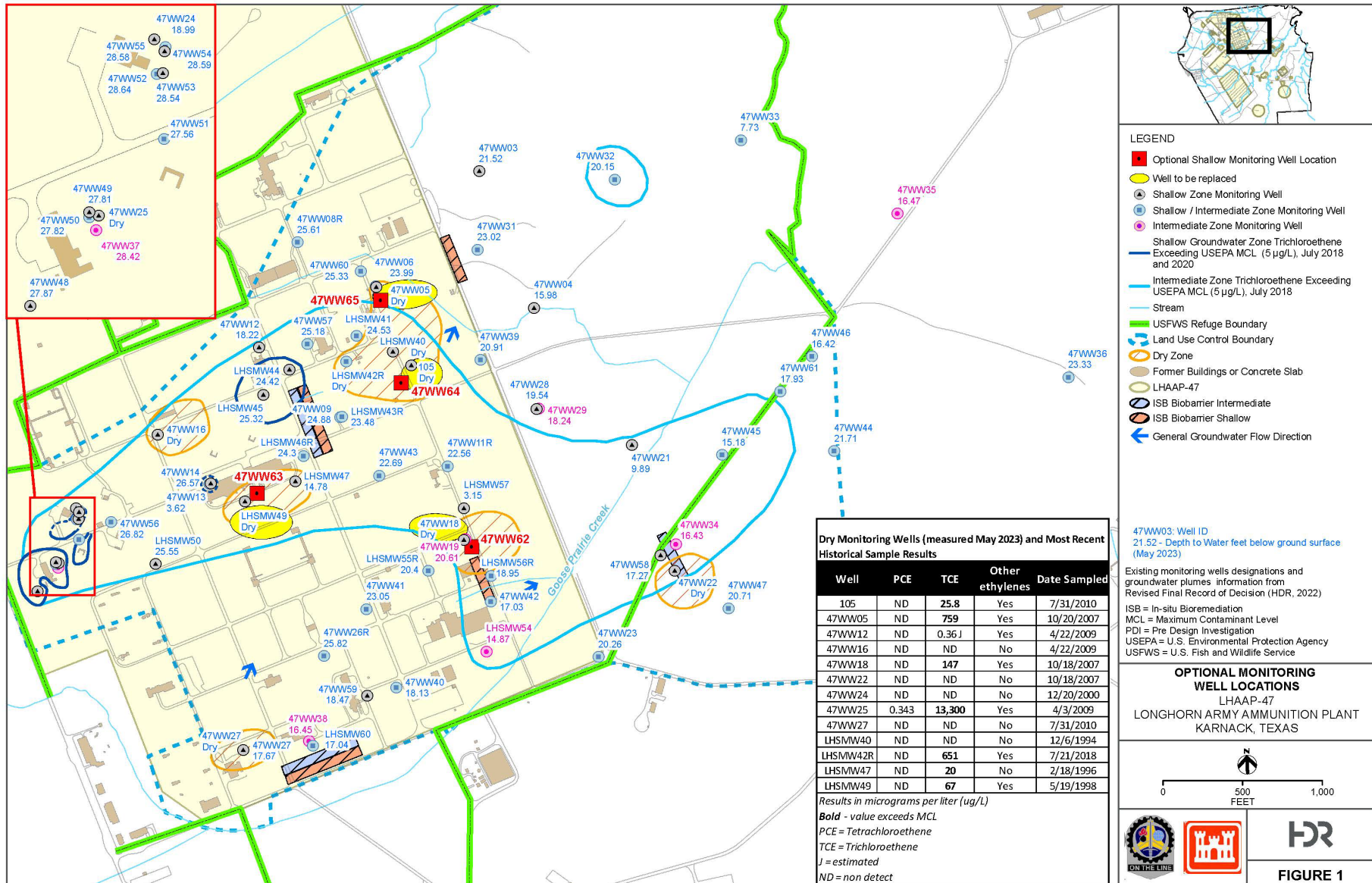
Pre-Design Investigation Status (cont.)

- 4 additional monitoring wells will be installed and sampled during Summer 2024.
- Pump test will also be performed to evaluate groundwater movement properties.
- Additional monitoring well groundwater data and pump test results will be provided as an addendum to the previous PDI Report.

Next Phase: Remedial Design

- PDI results will be utilized for consideration in the development of the Remedial Design.
- Remedial Design completion is estimated for August 2025.

LHAAP-47 UPDATE PDI WELL LOCATIONS



NEXT MEETING SCHEDULE AND CLOSING REMARKS

Schedule Next Restoration Advisory Board Meeting

Other Items/Remarks

Thank You For Coming

Fact Sheet: Active Sites

Longhorn Army Ammunition Plant (LHAAP)

27 June 2024 Restoration Advisory Board Meeting

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)

Fact Sheet: Active Sites
Longhorn Army Ammunition Plant (LHAAP)
27 June 2024 Restoration Advisory Board Meeting

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

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

Fact Sheet: Active Sites

Longhorn Army Ammunition Plant (LHAAP)

27 June 2024 Restoration Advisory Board Meeting

- 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

Fact Sheet: Active Sites
Longhorn Army Ammunition Plant (LHAAP)
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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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[illegible]

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-desorption/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

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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)

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

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NT	Nitrotoluene
PCE	Tetrachloroethene
TCA	Trichloroethane
TCE	Trichloroethene
TNB	Trinitrobenzene
TNT	Trinitrotoluene
UEP	Unlined Evaporative Pond
VC	Vinyl Chloride

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

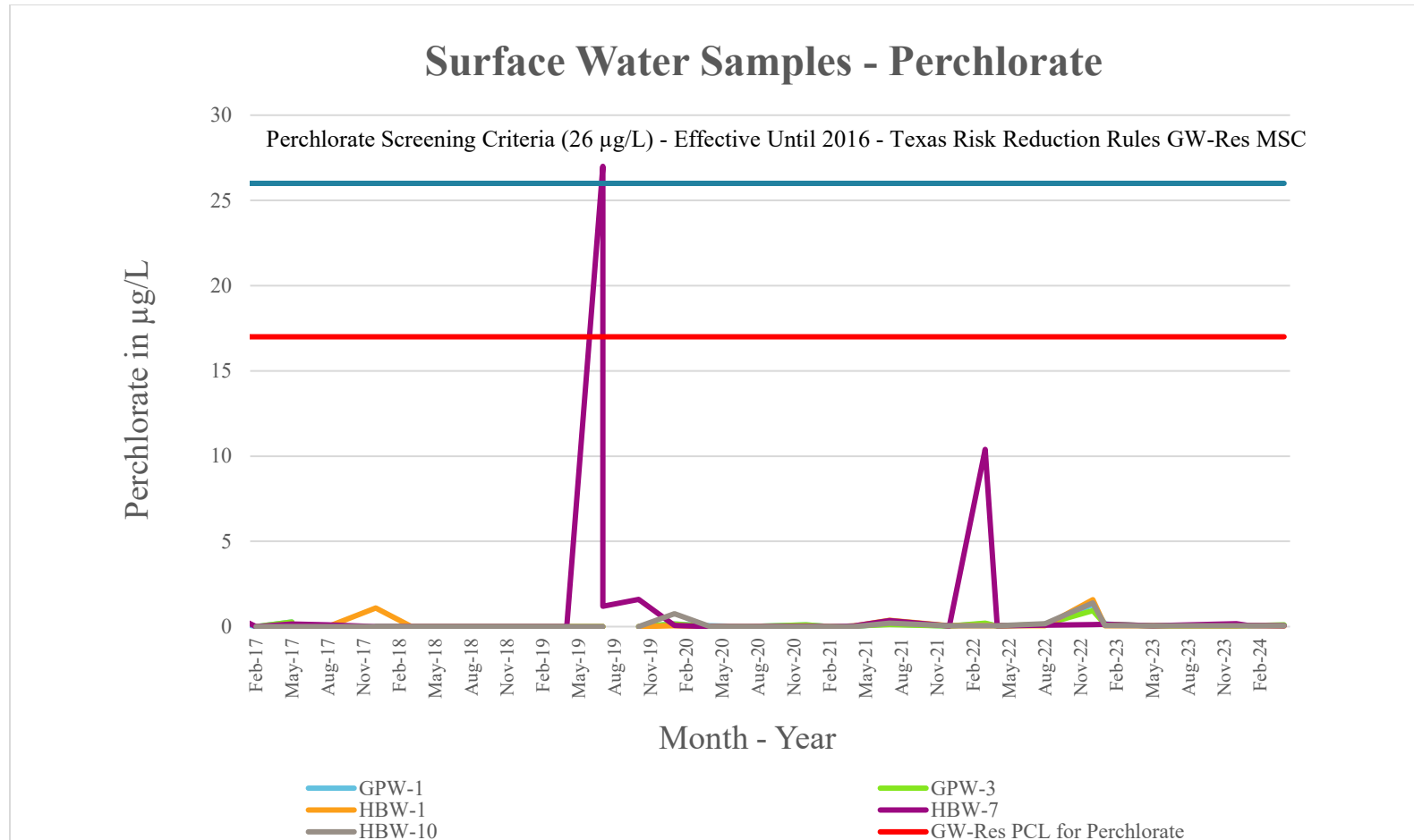
Quarter	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th
Creek Sample ID	Apr 2021	Jul 2021	Dec 2021	Mar 2022	Apr 2022	Aug 2022	Dec 2022	Jan 2023	May 2023	Jul-Sep 2023	Dec 2023
GPW-1	0.0268 J	0.154	0.0394 J	0.162	0.042 J	0.104	1.30	0.153	0.0286 J	Dry	0.0973 J
GPW-3	0.0321 J	0.122	0.0344 J	0.198	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
Creek Sample ID	Jan 2024	Apr 2024
GPW-1	0.0671 J	0.0907 J
GPW-3	0.0490 J	0.106
HBW-1	0.0693 J	0.0368 J
HBW-7	0.0772 J	< 0.05 U
HBW-10	0.0565 J	< 0.05 U

U – non-detect

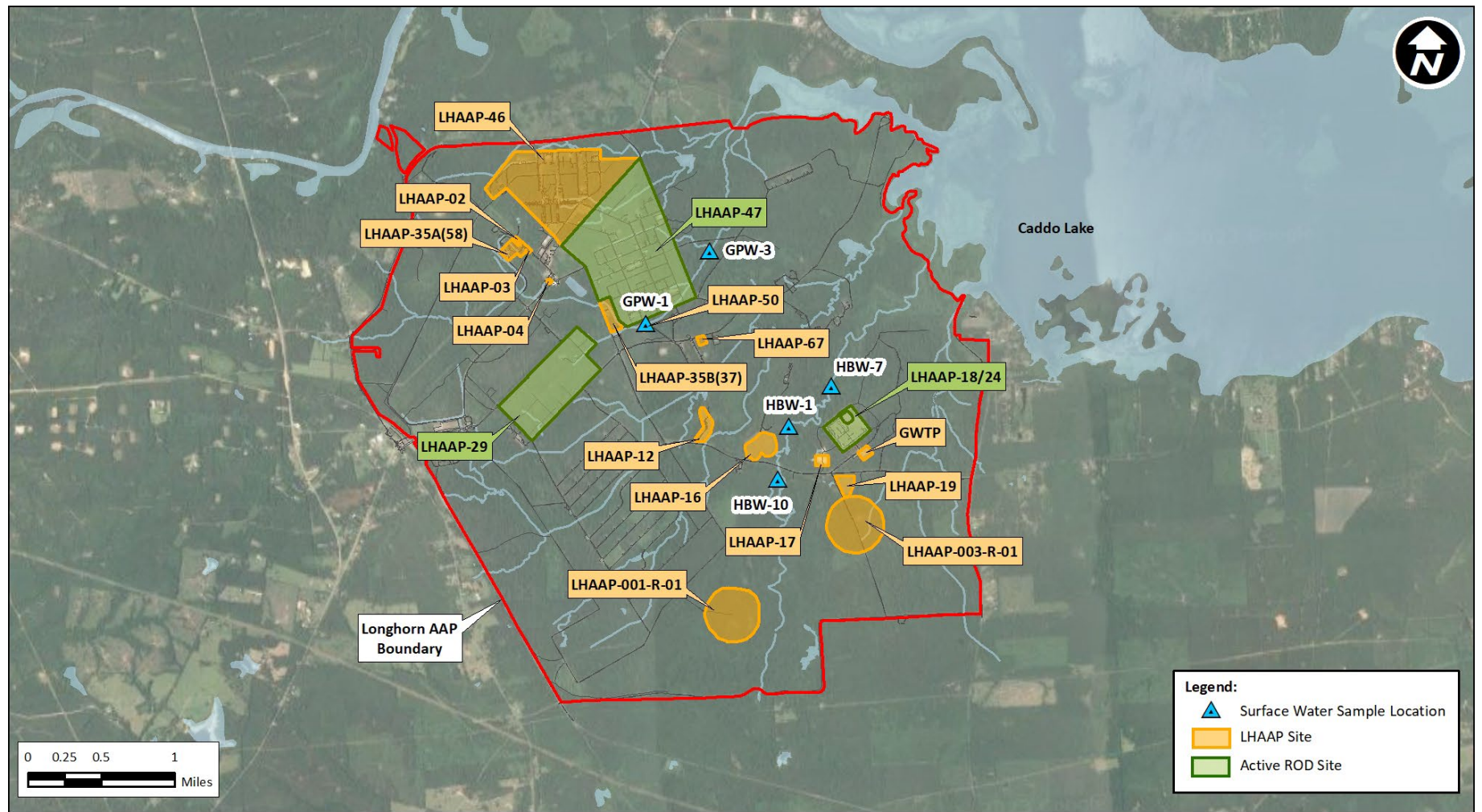
J – Estimated

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 (estimated result) µg/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; µg/L – micrograms per liter. No surface water sampling was conducted in the 3rd Quarter 2023 due to dry conditions.

Longhorn Army Ammunition Plant Creek Sampling Locations



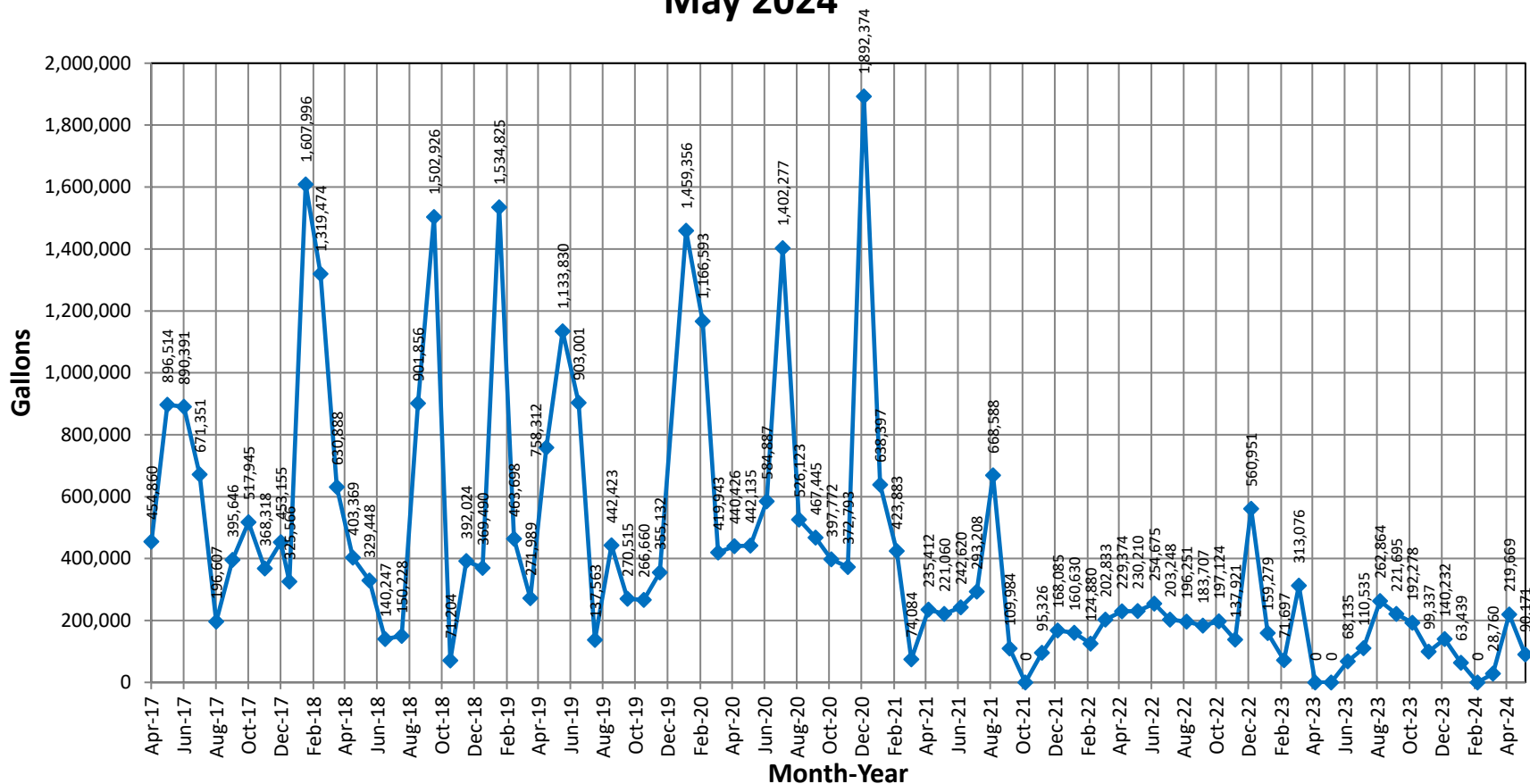
Groundwater Treatment Plant - Processed Groundwater Volumes

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										
219,669	90,171										

Treated Groundwater Discharged Monthly from April 2017 through May 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

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