Subject: Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting
Longhorn Army Ammunition Plant (LHAAP)
Location of Meeting: Conference Call
Date of Meeting: October 20, 2021, 6:00 PM Central Daylight Time (CDT)

Meeting Participants:

Army BRAC:	Rose M. Zeiler
USACE:	Aaron Williams, Chelsea Montoya
USAEC:	Ana C. Nieves, Lena Sierocinski
Bhate:	Kim Nemmers, Zach Beck
APTIM:	Bill Foss
HDR, Inc.	Philip Werner
TLI:	Kyra Donnell, Brian Gentry
USGS Liaison:	Christopher Braun
USEPA Region 6:	Brian Follin, Janetta Coats
TCEQ:	April Palmie
USFWS:	Paul Bruckwicki
RAB:	Present: Deon Hall, John Fortune, Sharon McAvoy, and Charles Dixon Absent: Donna Burney, Judy VanDeventer, Terry Britt; John Pollard, Jr.; Tom Walker; Richard LeTourneau; and Nigel R. Shivers
Public:	USEPA Technical Advisory Group: George Rice (Caddo Lake Institute [CLI]) and Laura-Ashleigh Overdyke (CLI)

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. Rose Zeiler explained that slides were included for abbreviations, acronyms, and agenda.

Minutes (July 2021 RAB Meeting)

Ms. Zeiler asked for any comments or additions to the RAB meeting minutes from the July 2021 conference call. Based on no additional input, Ms. Zeiler asked for a motion to approve. Mr. John Fortune made a motion to approve. Mr. Charles Dixon and Mr. Deon Hall seconded the motion to approve the minutes. Ms. Zeiler stated that the minutes were approved.

Membership Update

Ms. Zeiler said that the Army is always interested in new members for the RAB. She asked if anyone knew of people that were interested in joining the RAB. No one spoke up to mention any other people who may be interested. Ms. Zeiler stated that Mr. John Pollard appears to be no longer coming to RAB meetings anymore. Ms. Zeiler explained that the Army wants the public to be informed of the LHAAP activities and site status. She encouraged the RAB members to discuss what is happening at LHAAP with the public and let her know if anyone is interested in

joining.

Ms. Kim Nemmers presented the active sites at LHAAP managed by Bhate/APTIM, HDR, Inc., and MMG-TLI Joint Venture (JV). Ms. Nemmers presented the LHAAP site map, which shows the locations of each site within LHAAP.

Documents in Progress

Ms. Nemmers discussed the documents currently in progress. Ms. Nemmers explained that remedies have been put in place for most of the sites included in the Bhate contract. Ms. Nemmers explained that following implementation of remedies, there is periodic monitoring of the remedy performance, which is called Remedial Action Operation or RA-O. She explained that following implementation, RA-O is completed more frequently (quarterly) and that the sampling frequency is decreased over time to semi-annual and annual, which is why the type of events have the different frequencies. Ms. Nemmers said that RA-O Reports are in progress for LHAAP-16, -37, -46, -50 and -58. Ms. Nemmers said that the Quarterly Groundwater Treatment Plant (GWTP) Report is in progress for the 3rd Quarter 2021 (July through September 2021).

Completed Field Work since Last RAB Meeting

Ms. Nemmers discussed field work completed since the RAB meeting in July 2021, including the Year 2 Quarter 3 (August 2021) Performance Sampling at LHAAP-04; the Year 2 Quarter 3 (October 2021) Performance Sampling at LHAAP-16; the Year 2 Quarter 2 Performance Sampling (October 2021) at LHAAP-50; and the surface water sampling completed in July 2021. Ms. Nemmers explained that the surface water samples from Harrison Bayou and Goose Prairie Creek were collected in July 2021 and the data is presented in the handouts included with the RAB slides.

Three Month Look Ahead – Documents by Bhate/APTIM Team

Ms. Nemmers presented the 3 month look ahead for upcoming documents to be prepared by the Bhate/APTIM team. The list of documents included the RA-O Reports for LHAAP-46 and -50 and GWTP Quarterly Evaluation Report 3rd Quarter (July through September 2021).

Three Month Look Ahead – Field Work by Bhate/APTIM Team

Ms. Nemmers presented the 3 month look ahead for upcoming field work to be performed including the Year 2 Quarter 4 (November 2021) Performance Sampling at LHAAP-04; the annual sampling at LHAAP-12, and semi-annual sampling at LHAAP-18/24 and -58. The 4th Quarter surface water sampling will be completed when there is flow in the bayous.

GWTP Update

Ms. Nemmers presented an update on the operation of the GWTP including monthly treated groundwater discharged to the Harrison Bayou. She explained that the GWTP was over 20 years old and required regular maintenance, the details of which are not always presented to the RAB. However, the recent maintenance of the sand filter was presented to demonstrate the extent and size of the maintenance at times.

Ms. Nemmers explained how groundwater is pumped from the Burning Grounds site LHAAP-18/24 and from LHAAP-17 (in the future) to the GWTP for treatment as presented on Slide 12. Ms. Nemmers explained that the groundwater from LHAAP-17 is not currently being sent to the GWTP but is likely to begin in early 2022. Ms. Nemmers explained how metal precipitation was completed, noting that very low levels of metals were present in the extracted groundwater. She explained that the polymer was added to precipitate out the metals which was collected by the clarifier before going to the sand filter. Some of the polymer remains on the water such that it is captured by the sand filter. Over time, the sand filter gets clogged and has to be replaced. Ms. Nemmers then showed the crane used to place the new sand into the filter. She explained that two different types of sand had to be placed into the filter per the manufacturer's specifications. Mr. Fortune asked if the sand filter was gravity fed or under pressure. Ms. Nemmers answered that it was gravity fed.

Ms. Nemmers discussed the treated groundwater discharge on a monthly basis by explaining that the chart presented in the slides and handout shows water from both the INF pond as well as the GWTP. Ms. Nemmers explained that the low volume of water discharged was due in part to the performance of the sand filter restricting flow over the past several months. The surface water sample results continue to be very low level if detected; the handout provides the actual data.

LHAAP-16

Mr. Bill Foss presented the location of LHAAP-16 and the completed biobarriers just west of the Harrison Bayou. Mr. Foss said that Biobarrier 1 is adjacent to where Landfill 16 is located. Then there are a series of biobarriers intended to intercept the groundwater for treatment. The area shaded in yellow is what is called the Mid-Plume Area. A grid of injections within the yellow shaded area were completed for the shallow zone within the Mid-Plume area. Injections were also performed in the intermediate zone in the Mid-Plume Area. Emulsified Vegetable Oil (EVO) was the substrate injected to create the biobarriers.

Mr. Foss discussed well 16IW09 located within the Biobarrier 1 and monitoring well 16WW29 located slightly downgradient of the biobarrier. Mr. Foss explained that he would present each barrier by explaining what was being observed within the biobarrier and then what was occurring downgradient of the barrier. He explained that the first monitoring performance monitoring event occurred in April 2020 following the injections that were completed right at the end of 2019, to create the biobarriers. Then groundwater was sampled every three months after the injections, so the graphs include 6 quarters of monitoring though July 2021. The dark blue line is the groundwater elevation on each figure. The light blue line is the perchlorate concentration. The darker red of the lines is trichloroethylene (TCE). Vinyl chloride (VC) and cis-1,2-dichloroethene (DCE) are also presented on each graph and are daughter products from the breakdown of TCE.

For 16IW09 and 16WW26, an increase in the 2nd quarterly event occurred, but then dramatic decrease of contaminants of concern (COCs) to below the maximum contaminant level (MCL) occurred. Mr. Foss pointed out the slight increase in TCE and DCE in latest sampling event results. Due to the treatment approach being a biobarrier, Mr. Foss explained that some slight

fluctuations are expected. Monitoring well 16WW26 had TCE fluctuate, but then dropped to 26 micrograms per liter (µg/L), which is slightly above the MCL of 5 µg/L.

Mr. Foss presented the graphs for 16IW03 and 16PM09 in Biobarrier 2. For Biobarrier 2 results, a similar trend was observed with an initial increase and then continual decrease of the COCs at 16IW03. Mr. Foss explained that while COCs are still above the MCL this is exactly what is expected with the degradation of TCE. Mr. Foss pointed out that monitoring well 16PM09, which is downgradient of the barrier, has a similar pattern with continued decreasing trends.

Mr. Foss presented the graphs for 16IW10 and 16RW10 in Biobarrier 3. For Biobarrier 3, Mr. Foss pointed out that from July 2020 and July 2021 the TCE decreased dramatically with the daughter products increasing but then both daughter products drop off over time within Biobarrier 3. Monitoring well 16RW10 is located fairly close to the barrier so you see an initial decrease but then the January 2021 TCE increased. Mr. Foss said that this well will be watched over time.

For the shallow mid plume, there are no specific upgradient/downgradient monitoring locations. Monitoring well 16EW01 received substrate injections and we see a similar pattern as with other wells. Monitoring well 16WW30 demonstrates that all the COCs have decreased with TCE just above the MCL at 12 µg/L. Mr. Foss said that COC reductions are occurring within the treatment area; however, there are increasing trends for the COCs being observed downgradient of the treatment area. Mr. Foss explained that extraction wells were previously operating within the Mid-Plume Area as part of an interim remedy to contain the plume, which minimized the potential for plume migration. So some migration following elimination of the extraction is not unexpected.

For the intermediate Mid-Plume Area, injections were completed within the smaller yellow box. The largest decrease in COCs was observed in 16EW08, with groundwater detections remaining below MCLs. Mr. Foss said that monitoring well 16WW49 has a pattern of degradation to daughter products.

For the Bayou Biobarrier near Harrison Bayou, groundwater in this area has shown some fluctuations in groundwater flow direction. He said that the COCs are all near MCLs in the Bayou biobarrier. For monitoring well 16WW40 downgradient of the biobarrier, an increase in TCE was observed that will need to be assessed further.

Mr. Foss discussed the two monitoring wells installed across the bayou, which were delayed in installation due to presence of standing water. He pointed out the data gap from April and July 2020 when the wells could not be sampled due to the area being wet and trees being down, such that the wells were not accessible. However quarterly sampling has been occurring since that time. The two wells had COCs (TCE) increase in early 2021 and now the detections are decreasing. Mr. Foss said that there has been a question about how the groundwater flows under the bayou and so it will be interesting to see the trends for the COCs over time in the wells across from the bayou.

In summary, Mr. Foss said that the biobarriers are reducing COCs to below the MCLs.

Fluctuations in COC trends are being observed downgradient of the biobarriers, and time will be needed to better understand the trends. He continued by stating that the analytical results trends are what is expected for the remedy.

Mr. George Rice stated that the results look very good. He said that a few years ago the estimated time to cleanup LHAAP-16 was over 100 years. He then asked if the cleanup time had been updated based on these results. Mr. Foss said that no calculations have been done due to the limited data and fluctuations being observed. Once we get a little further along, Mr. Foss explained that sufficient data will be available to understand the concentrations trends and the recalculate the cleanup time. Mr. Foss then explained that the biological treatment was designed to keep the plume from getting to the bayou and that some level of contamination may continue to be released from the landfill.

LHAAP-04

Mr. Foss was asked by Ms. Zeiler to discuss LHAAP-04, which is a former pilot wastewater treatment plant by the fire station. Mr. Foss said that the site had a perchlorate plume groundwater that received substrate injections in November 2019 also. He said that one well had perchlorate above the cleanup goals in the first sampling event following the injections. However, since that first event perchlorate has been below the Protective Concentration Level (PCL) for the 6th quarter in a row. Additionally, in the latest sampling event in July 2021 perchlorate was non-detect in all wells for the first time. Mr. Foss explained that we are continuing to see low DO and negative ORP so that with those conditions we expect that degradation will continue for any residual mass.

Surface Water

Ms. Nemmers presented the surface water sampling results and stated that there were no exceedances to report.

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

Mr. Philip Werner discussed an overview of the sites where HDR, Inc. is completing investigations. The Army Draft of the Pre-Design Investigation (PDI) Report for LHAAP-18/24 has been prepared and under review and will then go to the Regulators for review at the end of October 2021. The draft LHAAP-18/24 remedial design (RD) is due to the Regulators in February 2022. LHAAP-29 is currently on hold due to reanalysis of data and obtaining additional data due to data gaps identified. The LHAAP-29 PDI Report will be due to Army in June 2022 followed by the draft RD in September 2022. Mr. Werner stated that the Draft Revised Record of Decision (ROD) for LHAAP-47 is being reviewed by the regulators.

Mr. Werner then presented the investigation this past spring/summer at LHAAP-18/24. He explained that direct push technology (DPT) borings were used to place temporary wells. Four new monitoring wells were installed in the area based on the results of the temporary wells groundwater data. He then presented summary of the analytical results from the investigation outside of the northeast boundary of the interceptor collection trench (ICT). Perchlorate was

detected at each of the 17 sample locations from the temporary wells. Thirteen of the samples exceeded the Texas Risk Reduction Program (TRRP) Tier 1 PCL for residential groundwater use. Nine of the perchlorate detections exceeded 5,000 parts per billion (ppb). TCE and daughter products were also detected in groundwater. Perchlorate is the most predominant of the compounds found in soils. Tetrachloroethylene (PCE), TCE and methylene chloride (MC) were also detected in the soil samples collected outside of the northeast ICT boundary.

Mr. Werner then explained that contamination is centered in the area defined by the purple dashed lines north of the LHAAP-18/24 where the proposed RD is planned. He pointed out that elevated concentrations are on either side of the planned RD area but northeast (also hydraulically downgradient), the concentrations decrease. The soil results support that mass is present and contributing to the high concentration levels in groundwater. Data collected will be used to assess the remediation design features. The additional investigation completed in the shallow aquifer zone where in-situ bioremediation (ISB) grids are planned includes groundwater locations where DPT borings were advanced and then two monitoring wells were installed. Perchlorate was detected in groundwater with seven samples having detections above 20,000 ppb. Volatile organic compounds (VOCs) were also above the MCLs and included 1,1,2-trichloroethane; benzene; DCE; MC; PCE; TCE; and VC. The highest concentrations of perchlorate are in the proposed RD treatment areas and then migrate to the southwest.

For LHAAP-29, the analytical laboratory (lab) had detection limits for explosives above the screening limits. However, a third-party lab was able to get below the screening limit based on a subset of the samples. Therefore, a second set of soil samples were sent to the third-party lab, which included 90 samples. Analytical results have been received and are being reviewed to develop the path forward. Mr. Fortune asked where the 90 samples were collected. Mr. Werner stated that multiple samples were collected from each DPT boring locations, with typically four soil samples per locations at different depth intervals to capture the vertical extent. The subset of data was selected based on the initial results and locations of the samples.

Ms. Laura Ashley Overdyke asked if seasonal fluctuations could affect the RD and if there is sufficient information to move forward. Mr. Werner said that the data collected for the groundwater occurred in early spring, when the water table was high. Mr. Werner said he would expect the results to be some of the most elevated regardless of seasonal variation. Ms. Nemmers then stated that groundwater is collected from LHAAP-18/24 on a semi-annual basis from permanent monitoring wells also and that this data will be used to support the RD. Mr. Werner concurred that his data is being used for the RD.

LHAAP-17 Remedial Action

Ms. Kyra Donnell presented the remedial action of excavation for various areas, followed by backfilling of the areas. She explained what work had been completed when a work stoppage occurred in 2019 due to munitions hazards being identified. Ms. Donnell explained that it was then determined that a time critical removal action was needed. On October 4, 2021, the work plan was approved and is currently being implemented. Site survey and vegetation removal has been completed. Erosion control measures are in place, and the backfill sources have been

analyzed and verified to be acceptable. Excavation areas are dramatically impacted due to precipitation. Ms. Donnell explained that much of the water has evaporated, but some areas still had water so discharging has been completed to assist in drying out the area. One area remains to be drained. Backfilling has occurred where areas are deemed clean. A screening and sift plant is being set up but is not completely installed. Ms. Donnell said when remote operations are being conducted, an explosives safety arc is established. Non-essential personnel are not allowed within the explosives safety area. Soils removed will be screened by the sift plant. Existing soil stockpiles in and around the site will also be moved through the sift plant. Any soil that is processed through the sift plant will be staged for offsite disposal. Once the sifting is done and the excavation and backfilling completed, metallic debris on the surface will be removed and a digital geophysical mapping of the site will be completed. If any targets of interest are identified during the mapping, then the targets will be investigated and removed. Once the site is determined to be clear of munitions items, a groundwater extraction system will be installed as the last activities.

Ms. Donnell then explained the segregation of materials by type. She stated that all munitions related debris would be inspected to verify no explosive hazard remains and document as safe (termed as MDAS) and temporarily store for later disposal off-site by a qualified vendor who will provide a certificate of destruction. Also, all non-munitions related debris would be temporarily stored for off-site disposal.

Ms. Donnell explained munitions and explosives of concern (MEC) will be inspected and stored properly onsite. If more than one MEC item is found, then a consolidation shot will be completed. Locations where MEC is encountered will be sampled along with where a detonation occurs. Sampling within the excavation to ensure that the contaminated material is removed. Standards below the cleanup levels will be confirmed. Site restoration will then occur. Exclusion zones were presented for the safety arc for non-essential personnel. Ms. Donnell presented photographs of the screening and sifting equipment that is currently being installed to segregate the soil from the other debris.

Ms. Donnell presented a figure that showed the areas in brown where excavation is continuing and the location of existing soil piles. She provided a photograph showing water in the impounded areas along with a stockpile area.

Ms. Zeiler asked Ms. Donnell about exposure noise and published information. Ms. Donnell said that a notice regarding the planned detonations had been published in the Marshall News Messenger and Shreveport Times. She explained that this work could continue through December 2021. Ms. Donnell said that a USACE module for determining the depth to bury the items to mitigate the fragments that would be blown, and also for noise reduction is being used. Ms. Janetta Coats asked about the notice. Ms. Zeiler said she has not yet sent it out. Ms. Donnell said that the notice is also on the LHAAP website. Ms. Zeiler said she would send out the notice to the RAB. Ms. Coats asked if the notice had a contact. Ms. Zeiler said the notice does have that information.

Next RAB Meeting Schedule and Closing Remarks

Ms. Zeiler then discussed the next meeting with the RAB members. It was decided that the next RAB meeting will be held on Wednesday, January 19, 2022. Ms. Zeiler said that Mr. Rice would be speaking about metals at LHAAP. Ms. Overdyke asked about the meeting being in person. Ms. Zeiler said that was the plan but it will depend. Ms. Overdyke expressed her interest to have it in person so that people can attend even if that means masks and similar precautions be necessary. Ms. Coats said the USEPA had an all hands meeting canceled in November regarding green light to go in the field. Her organization still has restrictions that do not allow for travel unless an emergency. Ms. Zeiler said that an in person meeting is still likely.

Ms. Zeiler asked if there is anything that the RAB members want to hear more about. Mr. Fortune asked if LHAAP-04 was the old power plant. Ms. Zeiler responded no but it is next to the old power plant. She explained that a large soil removal occurred at LHAAP-04 in 2009 for perchlorate, and now the groundwater seems to be looking good. Ms. Zeiler said that LHAAP-04 can be presented at the next RAB Meeting.

Adjourn

The meeting adjourned at 7:24 pm CDT.

October 2021 Meeting Attachments and Handouts:

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

Longhorn Army Ammunition Plant Quarterly Restoration Advisory Board Meeting

October 20, 2021
6:00 PM CDT

APTIM

bhate

Restoration Advisory Board Meeting

Abbreviations and Acronyms

µg/L	Micrograms per liter
COC	Chemical of concern
DCE	Dichloroethene
DERP	Defense Environmental Restoration Program
DPT	Direct push technology
GPW	Goose Prairie Creek Water Sample
GWP-Ind	Industrial Groundwater Use Protection
$^{GW}GW_{Ing}$	Residential groundwater use
GWTP	Groundwater Treatment Plant
HBW	Harrison Bayou Water Sample
ICT	Interceptor collection trench
ISB	In-situ bioremediation
J	Estimated laboratory value
LHAAP	Longhorn Army Ammunition Plant
MC	Methylene chloride
MCL	Maximum Contaminant Levels
MDAS	Material Documented As Safe
MEC	Munitions and explosives of concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MSC	Medium-Specific Concentration
PCE	Tetrachloroethene
PCL	Protective Concentration Level
RAB	Restoration Advisory Board
PDI	Pre-Design Investigation
RA(O)	Remedial Action Operation
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TNT	Trinitrotoluene
TOI	Targets of interest
TRRP	Texas Risk Reduction Program
VC	Vinyl chloride
VOC	Volatile organic compound

Restoration Advisory Board Meeting

Agenda

06:00 Welcome and Introduction

06:05 Open Items {RMZ}
-Purpose of the Restoration Advisory Board (RAB) Meeting
-Ongoing Outreach/Website
-RAB Administrative Issues
- o Membership Update
- o Minutes (July 2021 RAB Meeting)

06:15 Defense Environmental Restoration Program (DERP) Update {Bhate}
- Documents and Field Work Completed since last RAB
  - o LHAAP-16 Performance Sampling
- Three Month Look Ahead
- Groundwater Treatment Plant (GWTP) Update

06:30 Other DERP Update
-LHAAP-18/24, -29, and -47 Status {HDR}
-LHAAP-17 Status {MMG-TLI}

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

RAB Administrative Issues

- Membership Update
  - Persons interested in being new members
- Minutes (July 2021 RAB Meeting)

The Army Wants You to be Informed

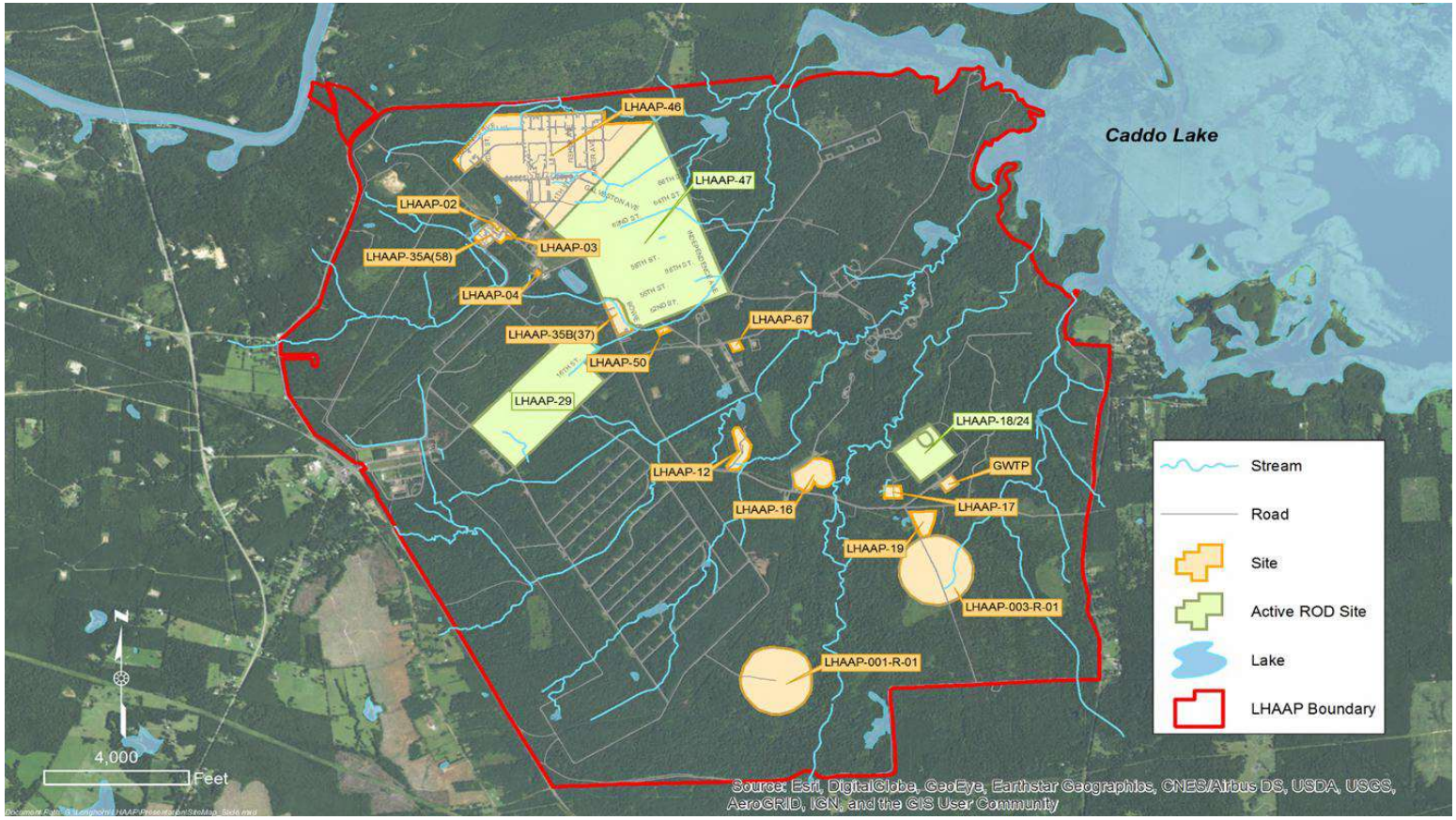
- The Army is committed to protecting human health and the environment; key to that commitment is engaging the community and increasing public participation in environmental restoration at the Longhorn Army Ammunition Plant (LHAAP)
- You are encouraged to:
  - Attend RAB Meetings and/or become a member 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.

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: LHAAP-17

Restoration Advisory Board Meeting

Bhate/APTIM



Restoration Advisory Board Meeting

Documents in Process

Site	Document
LHAAP-16	Annual Remedial Action Operation (RA[O]) Report to Regulators
LHAAP-37	Annual RA(O) Report – to Regulators
LHAAP-46	Annual RA(O) Report – in progress
LHAAP-50	Annual RA(O) Report – in progress
LHAAP-58	Annual RA(O) Report – to Regulators
GWTP	Quarterly Evaluation Report: Third Quarter (July –September 2021) in progress

Restoration Advisory Board Meeting

Completed Field Work Since Last RAB Meeting

Site	Activity
LHAAP-04	Year 2 Quarter 3 Performance Monitoring (August); final ROD approved 2016; baseline groundwater sampling in Jan. 2018
LHAAP-16	Year 2 Quarter 3 Performance Monitoring (October); Previously sampled as part of the GWTP operations
LHAAP-50	Year 8 of RA(O) Groundwater Monitoring; Year 2, Quarter 2 Performance Sampling (October)
Surface Water	Surface Water Sampling

Restoration Advisory Board Meeting

3 Month Look Ahead – Documents by Bhate Team

Site	Document
LHAAP-46	Draft RA(O) Report to regulators
LHAAP-50	Draft RA(O) Report to regulators
GWTP and LHAAP-18/24	Quarterly Evaluation Report Third Quarter (July – September 2021)

Restoration Advisory Board Meeting

3 Month Look Ahead - Field Work by Bhate Team

Site	Activity
LHAAP-04	Year 2 Quarter 4 Performance Monitoring (November)
LHAAP-12	Annual RA(O) Sampling (December)
LHAAP-18/24	Semi-Annual Groundwater Sampling (December)
LHAAP-58	Semi-Annual Groundwater Sampling (December)
Surface Water	4th Quarter Sampling

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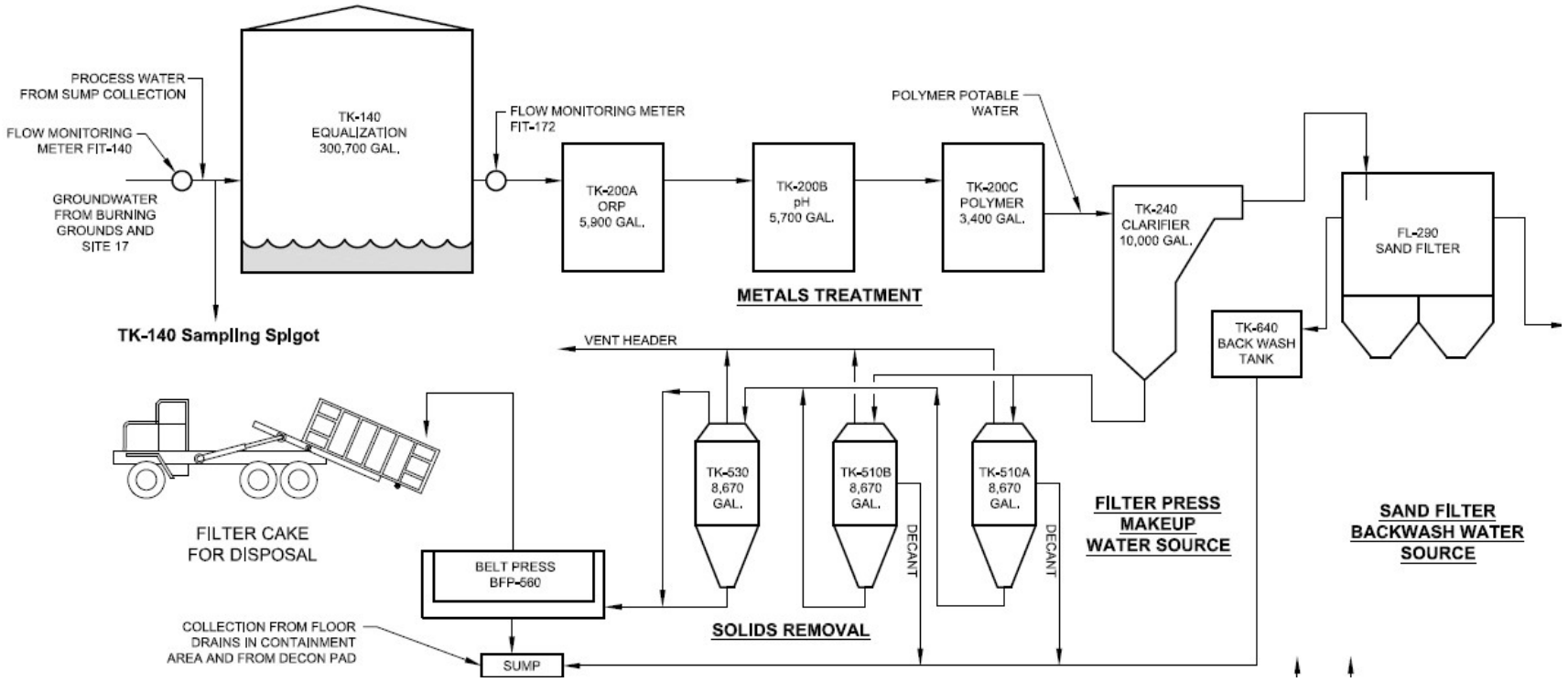
GWTP Update

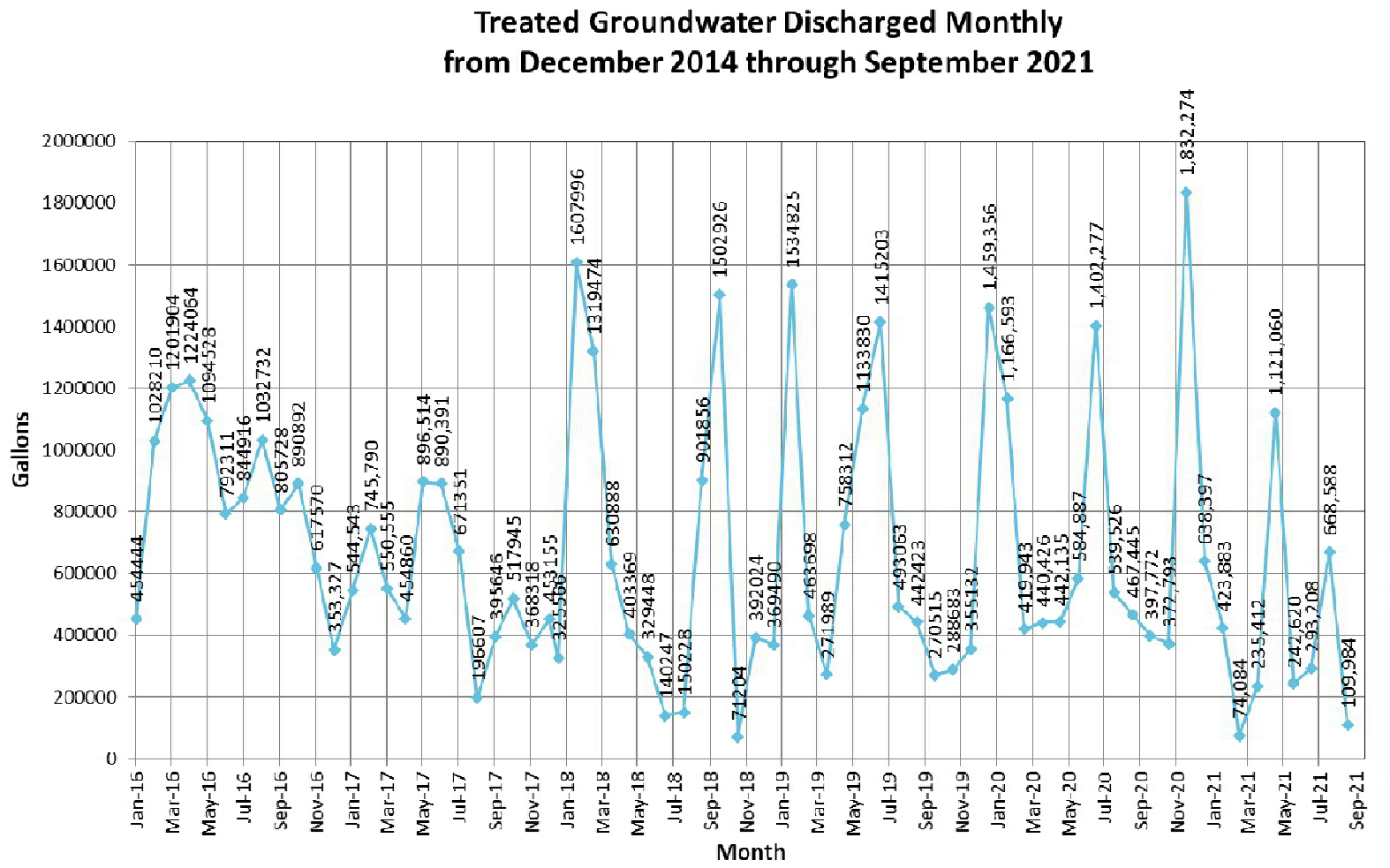


Restoration Advisory Board Meeting

GWTP Update

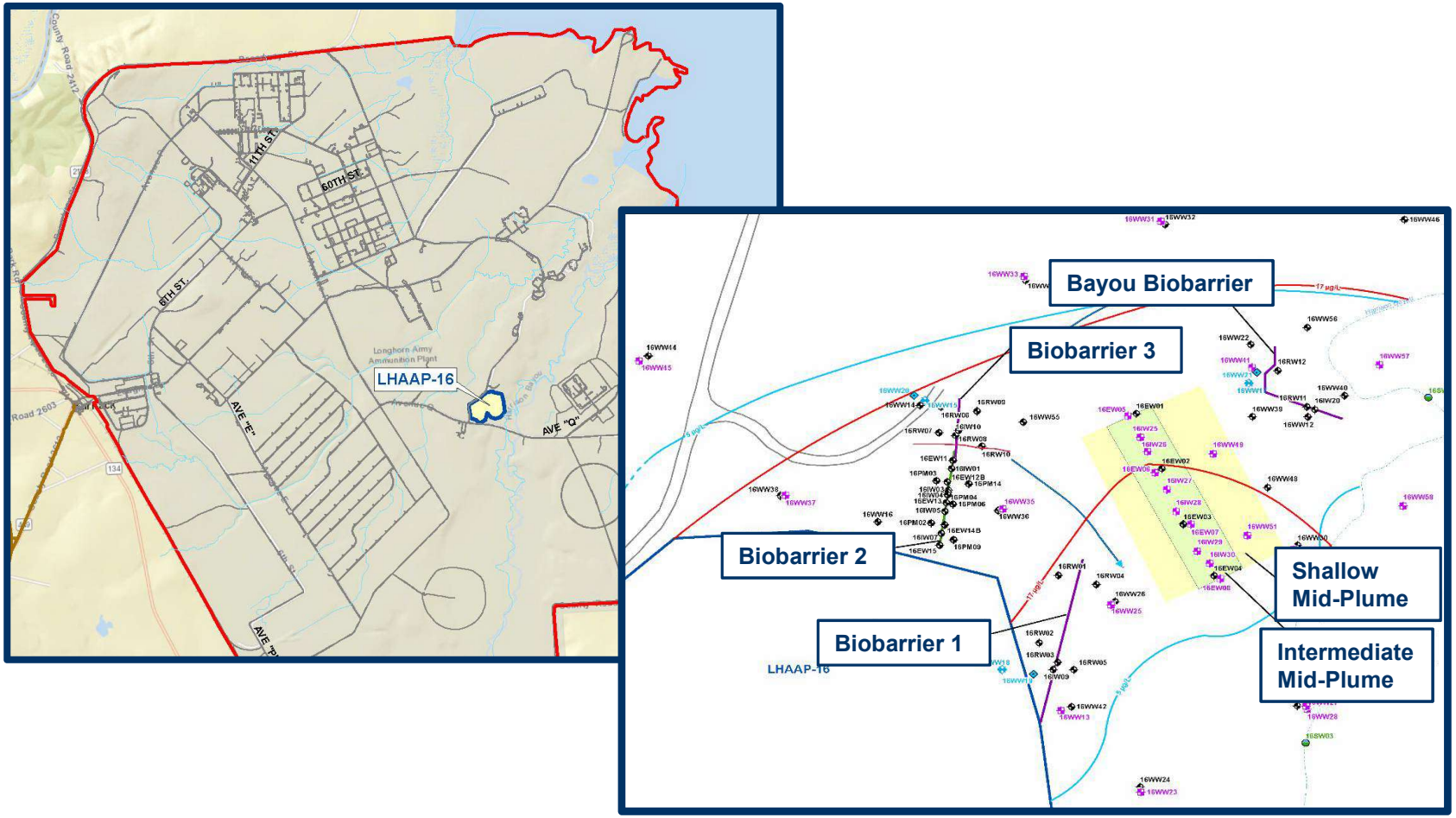
Restoration Advisory Board Meeting

GWTP Update



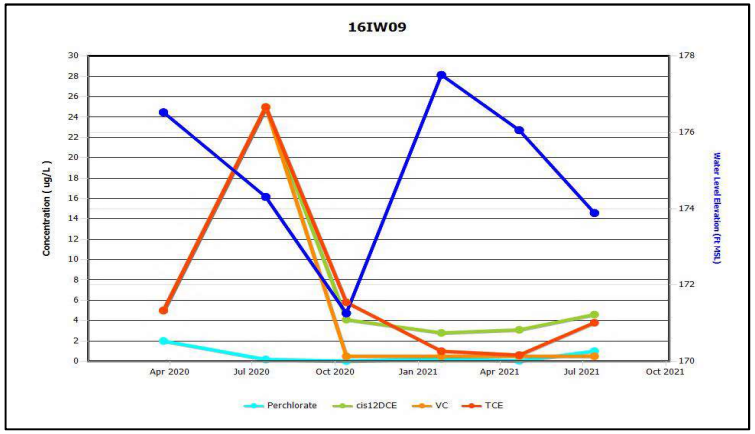
Restoration Advisory Board Meeting

LHAAP 16

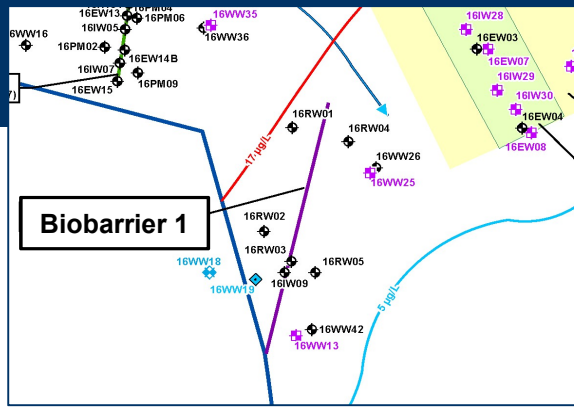


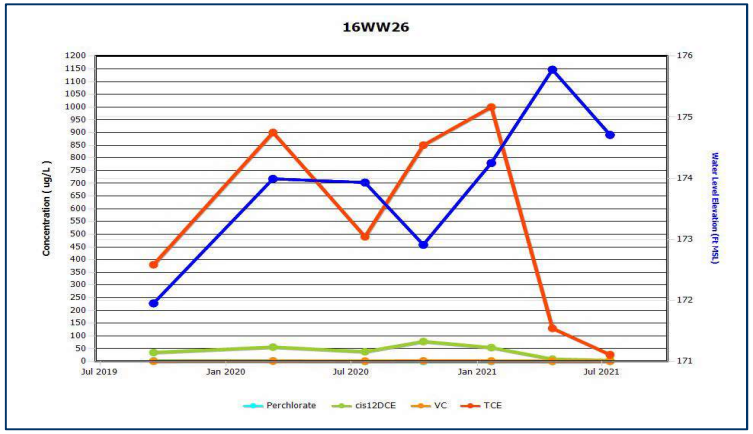
Restoration Advisory Board Meeting

LHAAP 16 Biobarrier 1



- 16IW09
- Located in the biobarrier
- All chemicals of concern (COCs) are below the Maximum Contaminant Level (MCL)
- Slight increase intrichloroethene (TCE) and cis-1,2-dichloroethene (DCE)
- Biobarrier is working as designed

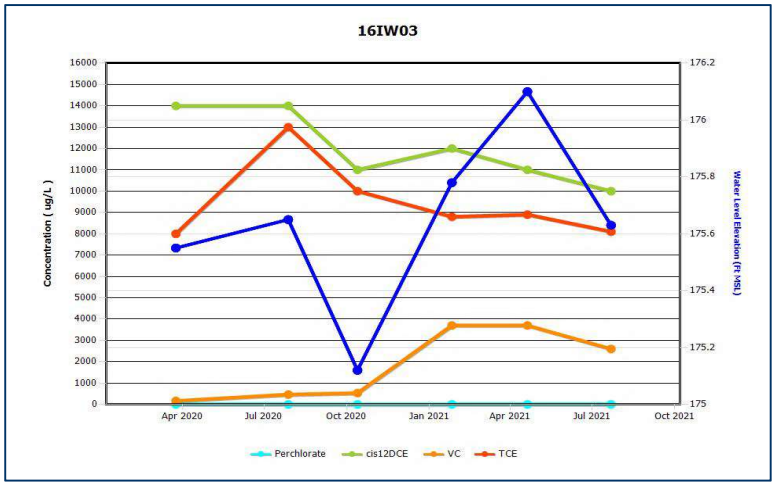


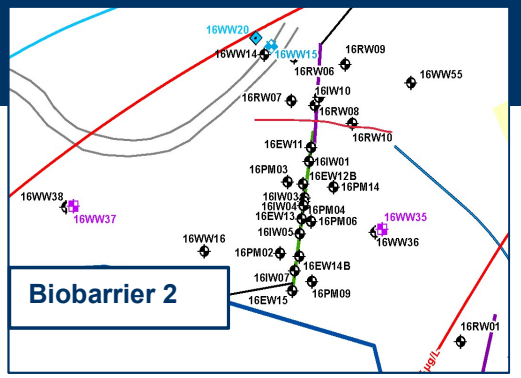


- 16WW26
- Located downgradient
- Only TCE is above the MCL of 5 micrograms per liter (µg/L) at 26 µg/L

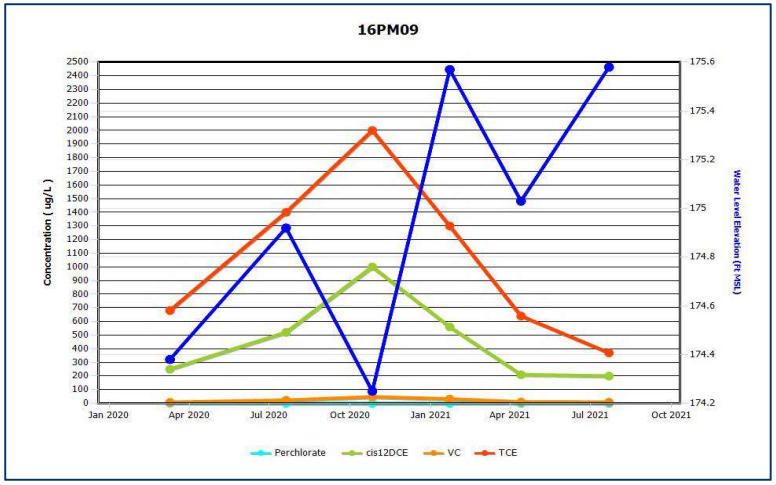
Restoration Advisory Board Meeting

LHAAP 16 – Biobarrier 2





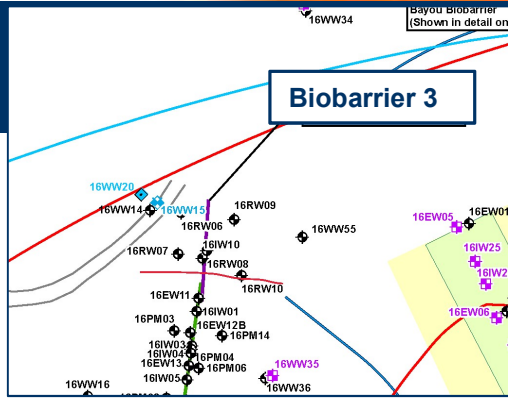
- 16IW03
- Located in the biobarrier
- TCE and cis-1,2-DCE are fluctuating
- Vinyl chloride (VC) and ethene have increased
- These trends suggest reductive dechlorination is occurring

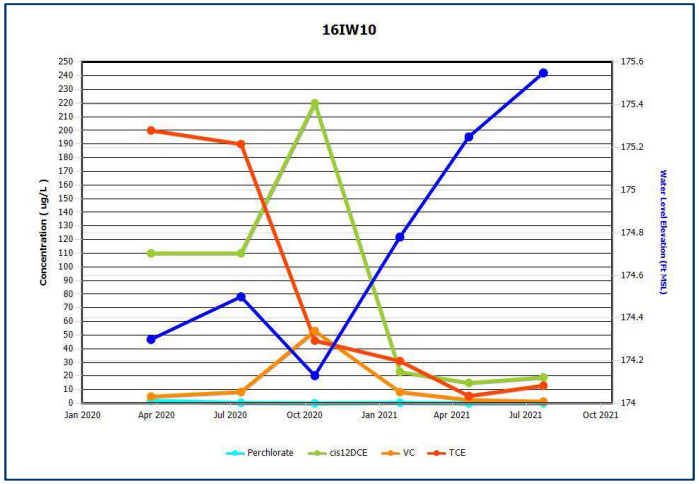


- 16PM09
- Located downgradient
- TCE, cis-1,2-DCE, and VC are all decreasing

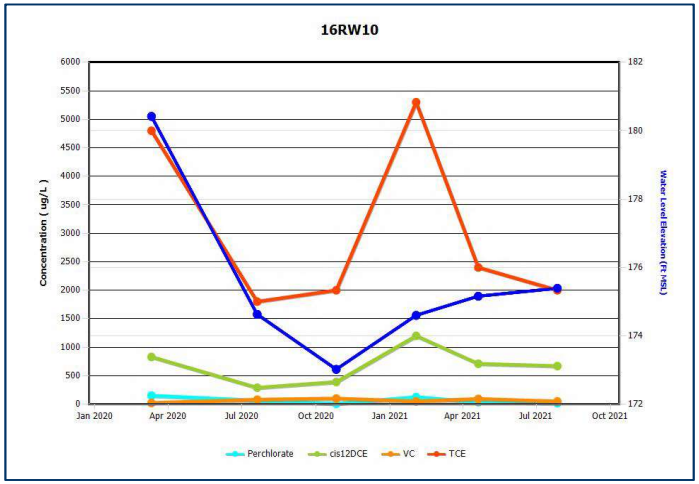
Restoration Advisory Board Meeting

LHAAP 16 – Biobarrier 3





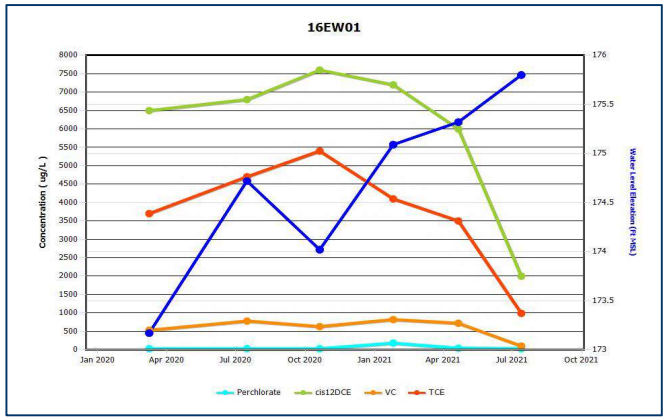
- 16IW10
- Located in the biobarrier
- Overall decreasing concentrations of all COCs
- Biobarrier is working as designed



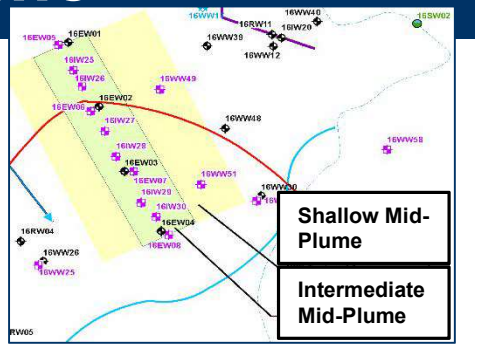
- 16RW10
- Located downgradient
- Overall decreasing concentrations of COCs

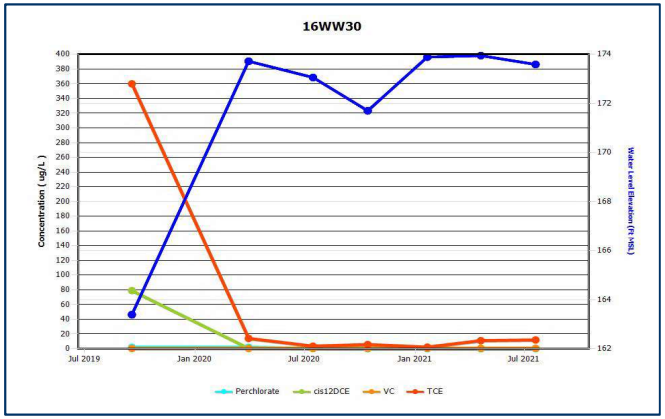
Restoration Advisory Board Meeting

LHAAP 16 – Shallow Mid Plume

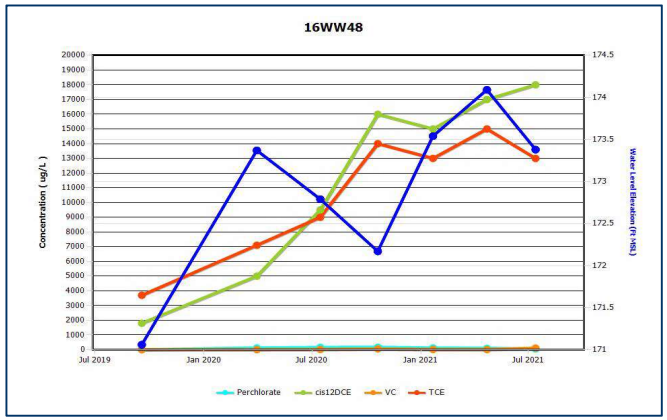


- 16EW01
- Located in the biobarrier
- All COCs are decreasing
- TCE is at 990 µg/L
- Biobarrier is working as designed





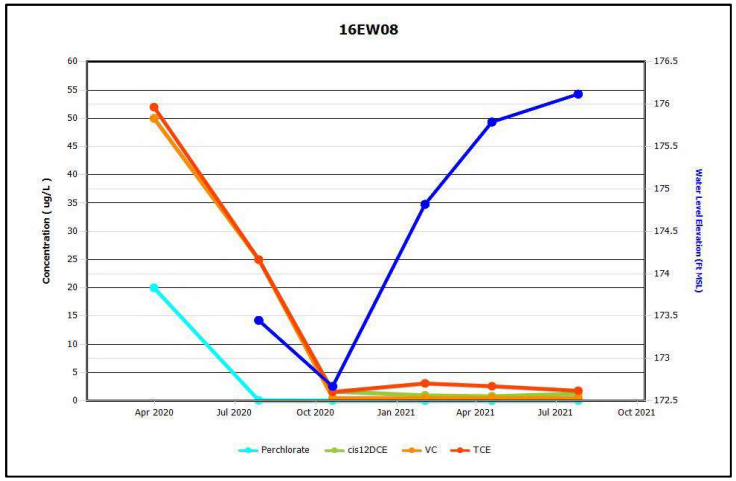
- 16WW30
- Located downgradient of the biobarrier
- All COCs are decreasing
- TCE is at 12 µg/L



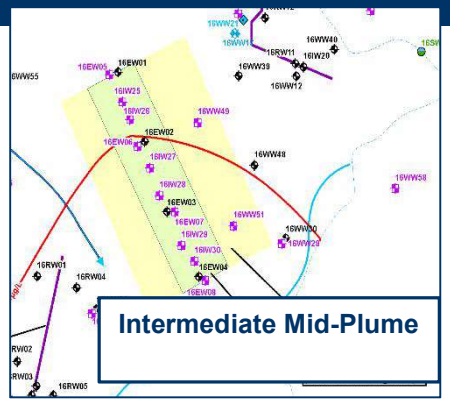
- 16WW48
- Located farther downgradient of the biobarrier beyond the influence of the extraction wells prior to injections
- COCs are increasing

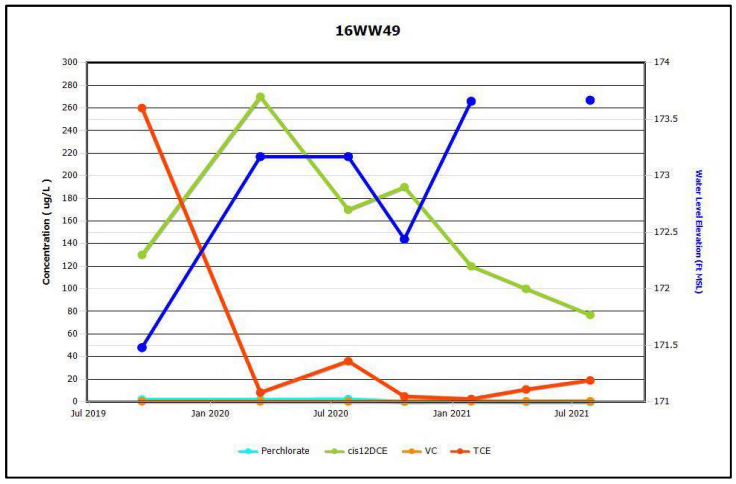
Restoration Advisory Board Meeting

LHAAP 16 – Intermediate Mid Plume



- 16EW08
- Located in the biobarrier
- Overall decreasing concentrations
- COCs are all below MCLs
- Biobarrier is working as designed

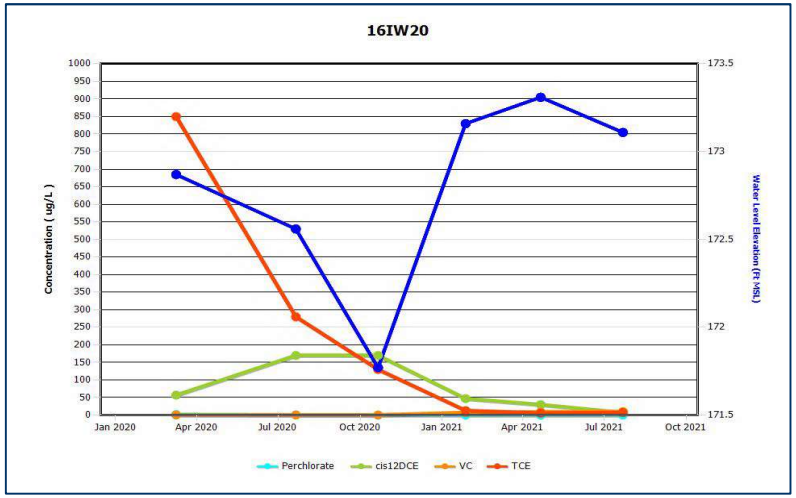


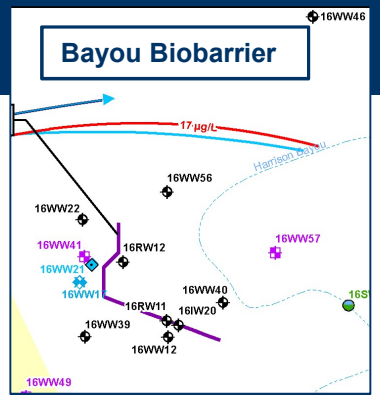


- 16WW49
- Located downgradient of biobarrier
- Overall TCE and cis-1,2-DCE are decreasing

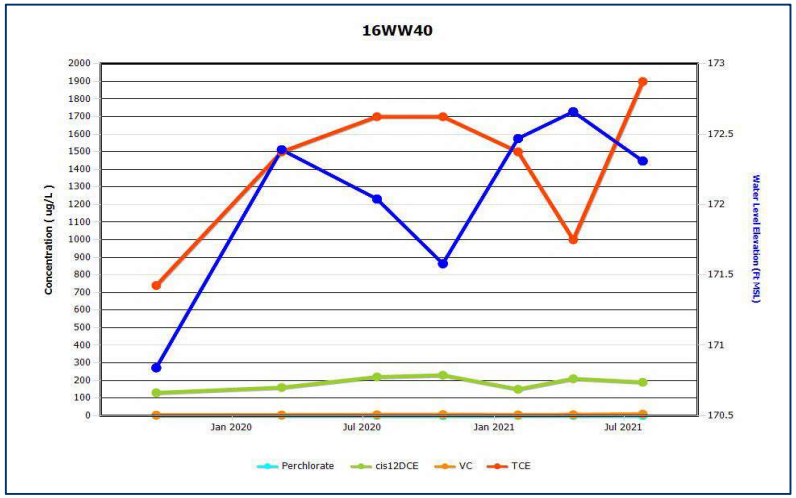
Restoration Advisory Board Meeting

LHAAP 16 – Bayou Barrier





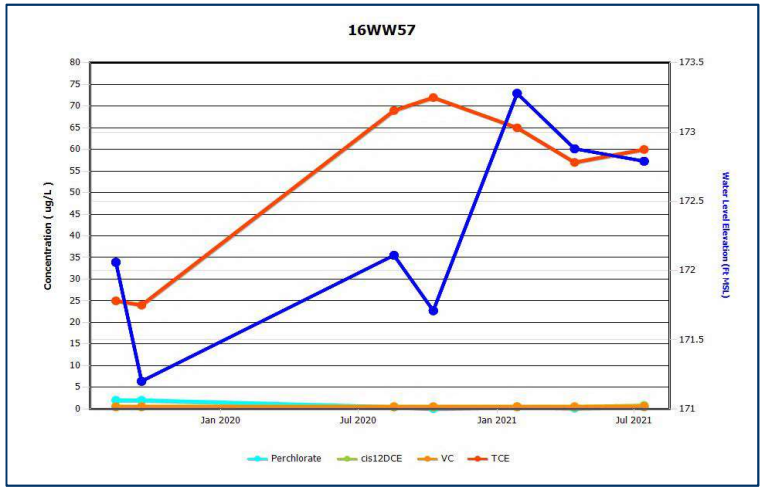
- 16IW20
- Located in the biobarrier
- Overall decreasing concentrations of COCs
- TCE is at 7.6 µg/L
- VC is at 10 µg/L
- Ethene is increasing indicating that reductive dechlorination is occurring
- Biobarrier is working as designed



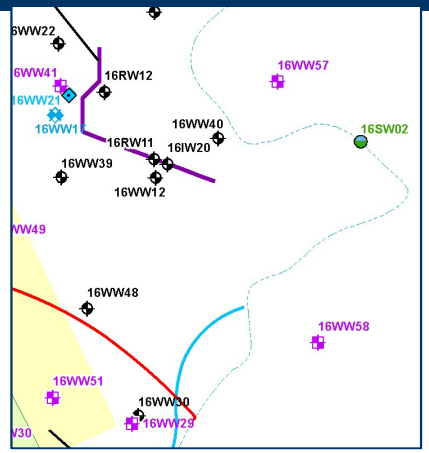
- 16IW40
- Located downgradient of Biobarrier
- TCE is fluctuating as this is farther downgradient and it will take longer for treated clean groundwater to decrease COCs

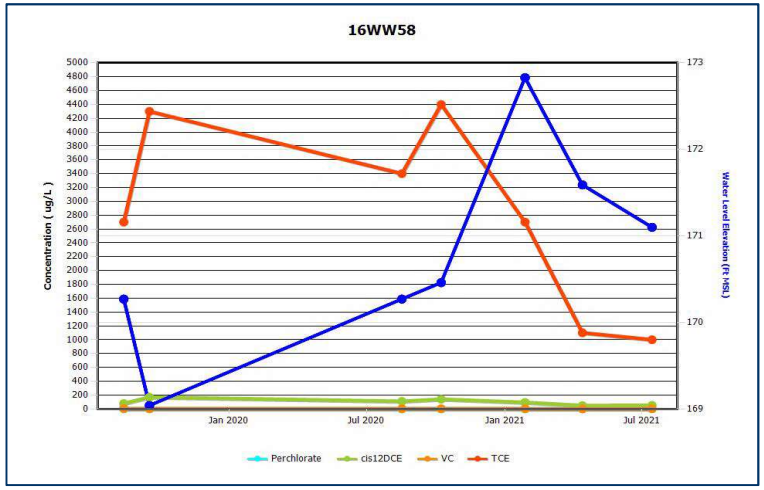
Restoration Advisory Board Meeting

LHAAP 16 – Across Harrison Bayou



- 16WW57
- Located across Harrison Bayou
- Overall concentrations are increasing
- Groundwater levels may also be contributing to concentration trend

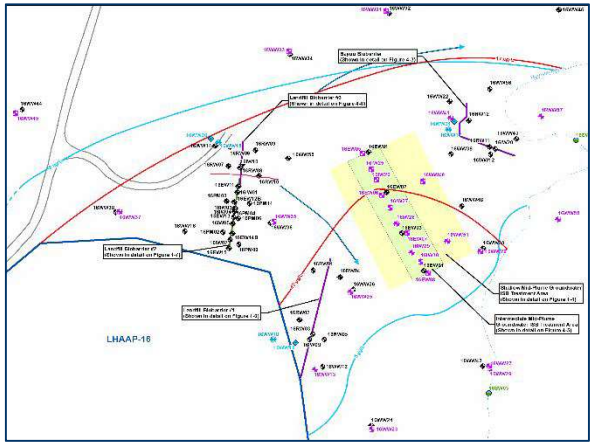




- 16WW58
- Located across Harrison Bayou
- TCE is decreasing
- All other COCs are below their MCL or detection limit.
- The treatment may be aiding in reducing concentrations
- Groundwater levels may also be contributing to concentration trend

Restoration Advisory Board Meeting

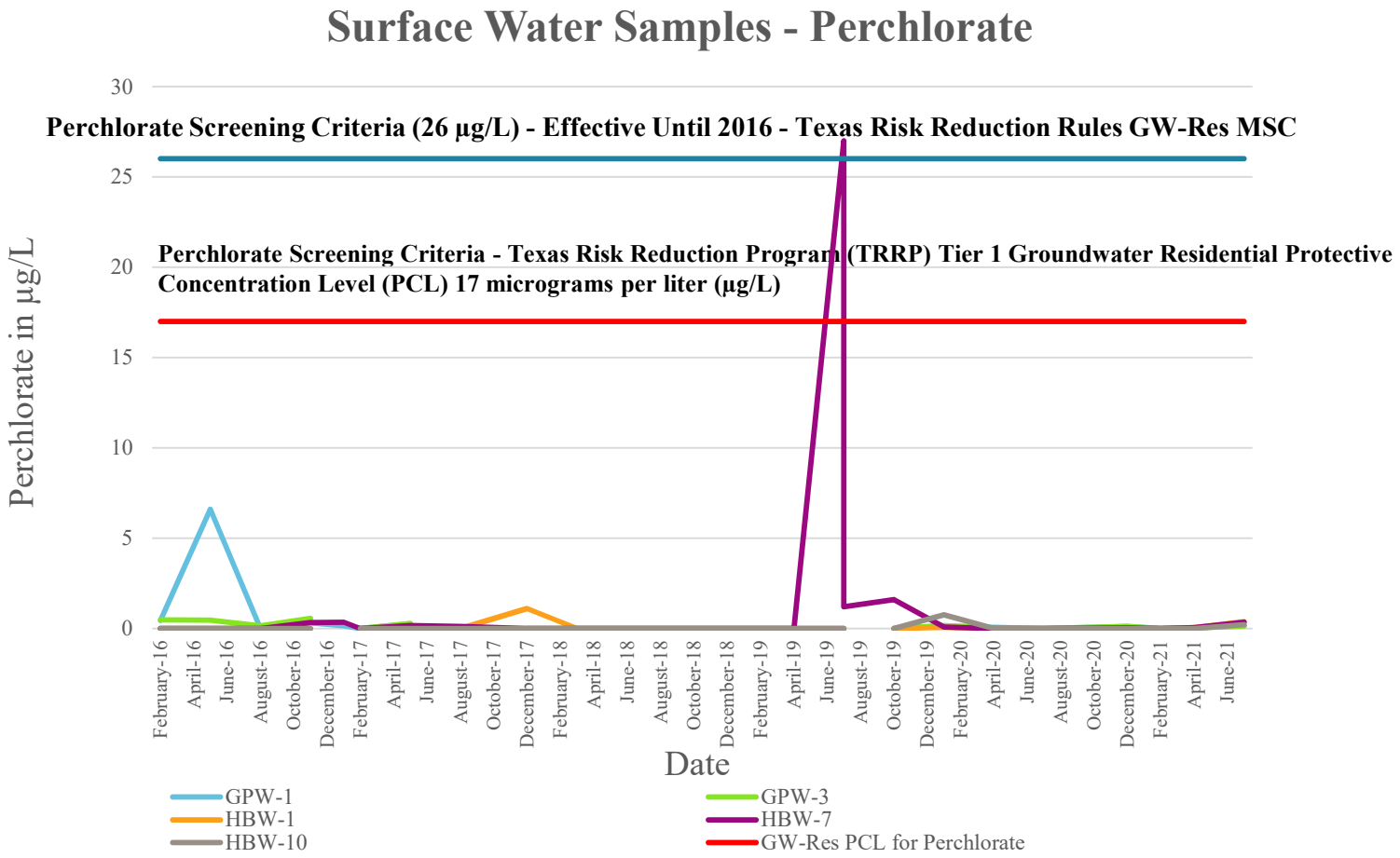
LHAAP 16 – Conclusion



- Biobarriers are reducing COCs in the barrier to below MCLs and treating groundwater that migrates through.
- Treated groundwater is migrating downgradient and reducing COCs.
- Fluctuations and increases are being observed at some wells.
- Groundwater levels may be influencing concentration trends at some locations.
- After two years of post injection data, the multiple biobarriers at LHAPP-16 are reducing COCs at the site, as designed.

Restoration Advisory Board Meeting

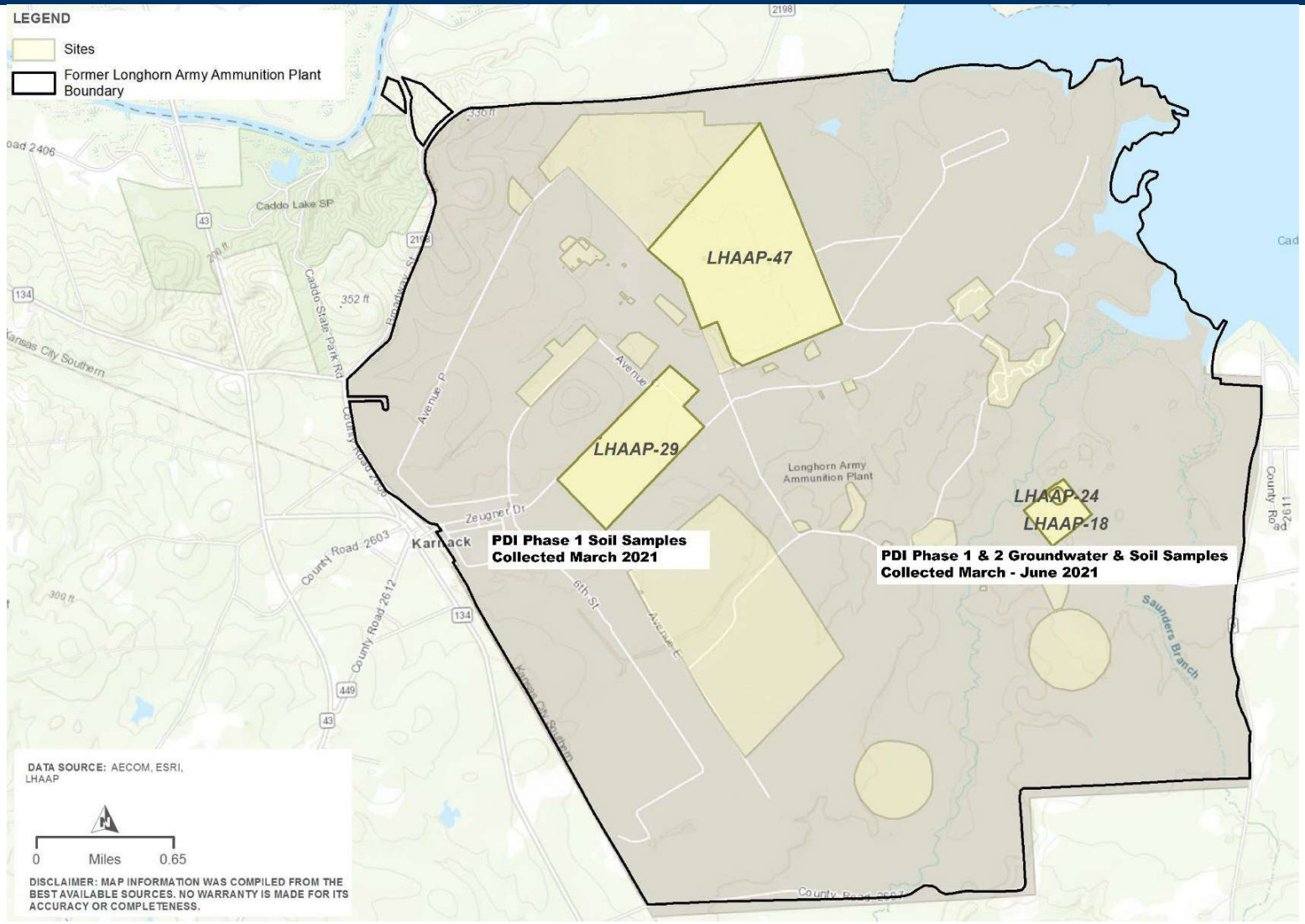
Surface Water Sample Results



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

Restoration Advisory Board Meeting

HDR



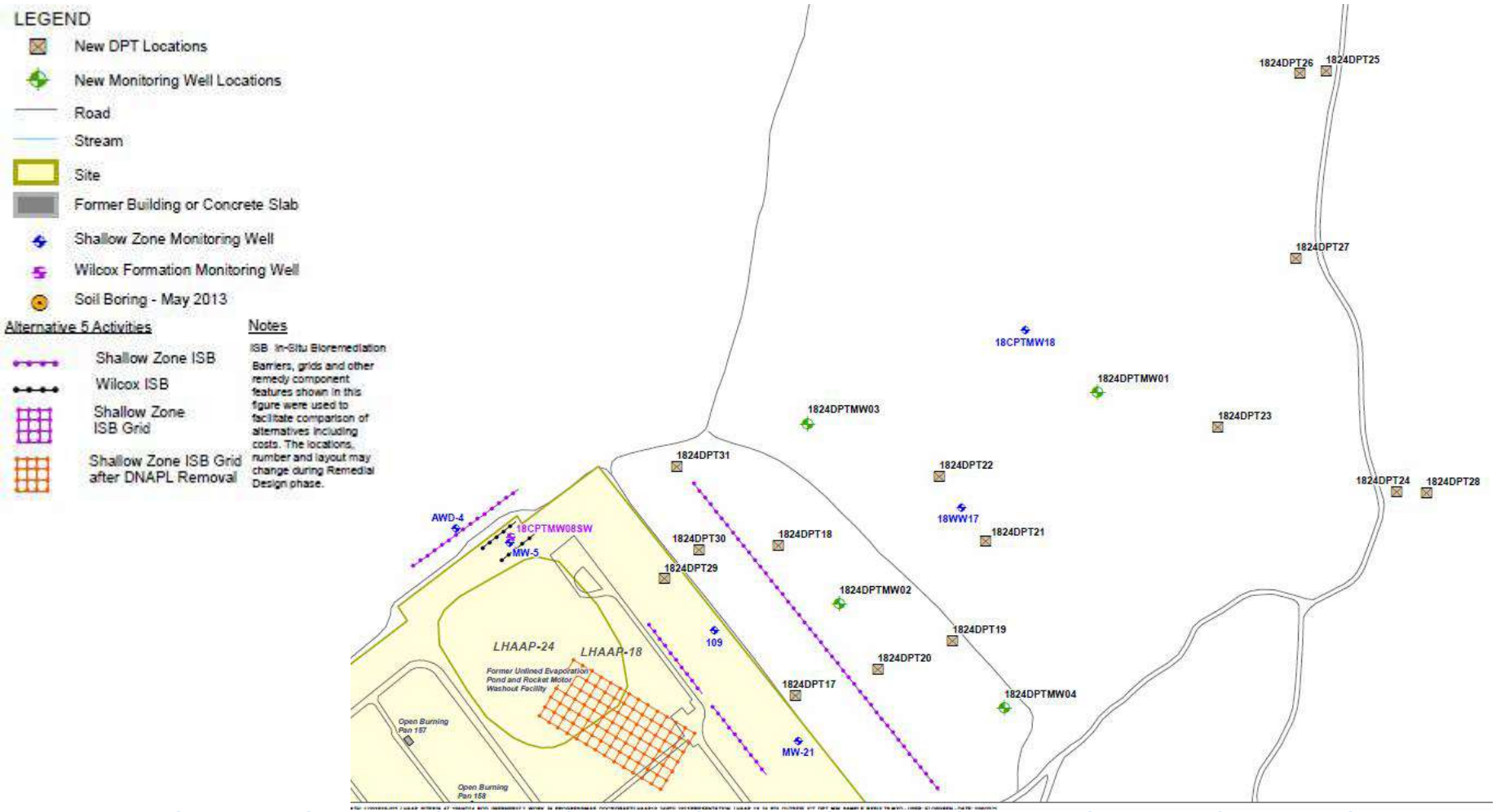
Restoration Advisory Board Meeting

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

Site	Document
LHAAP-18/24	Draft Pre-Design Investigation (PDI) Report, October 2021
LHAAP-18/24	Draft Remedial Design, February 2022
LHAAP-29	Draft PDI Report, June 2022
LHAAP-29	Draft Remedial Design, September 2022
LHAAP-47	Draft Record of Decision, September 2021

Restoration Advisory Board Meeting

DPT and Permanent Well Locations Outside the ICT Boundary



Restoration Advisory Board Meeting

Summary of LHAAP-18/24 Phase 2 PDI Field Work

- PDI Field Work Outside the Interceptor Collection Trench (ICT) Northeast Boundary, June 2021

Preliminary Findings - Groundwater

- ✓ **Perchlorate was detected in 17 of 17 temporary wells located outside the Northeast ICT Boundary. 13 samples had concentrations that exceeded the Texas Risk Reduction Program (TRRP) Tier 1 Protective Concentration Level (PCL) for residential groundwater use ($^{GW}GW_{Ing}$).**
- ✓ **Nine perchlorate detections exceeded 5,000 µg/L.**
- ✓ **The volatile organic compounds (VOCs) cis-1,2-DCE (1 out of 17 temporary wells), TCE (9 out of 17 temporary wells), and VC (2 out of 17 temporary wells) were detected at concentrations that exceeded the MCLs.**

Restoration Advisory Board Meeting

Summary of LHAAP-18/24 Phase 2 PDI Field Work

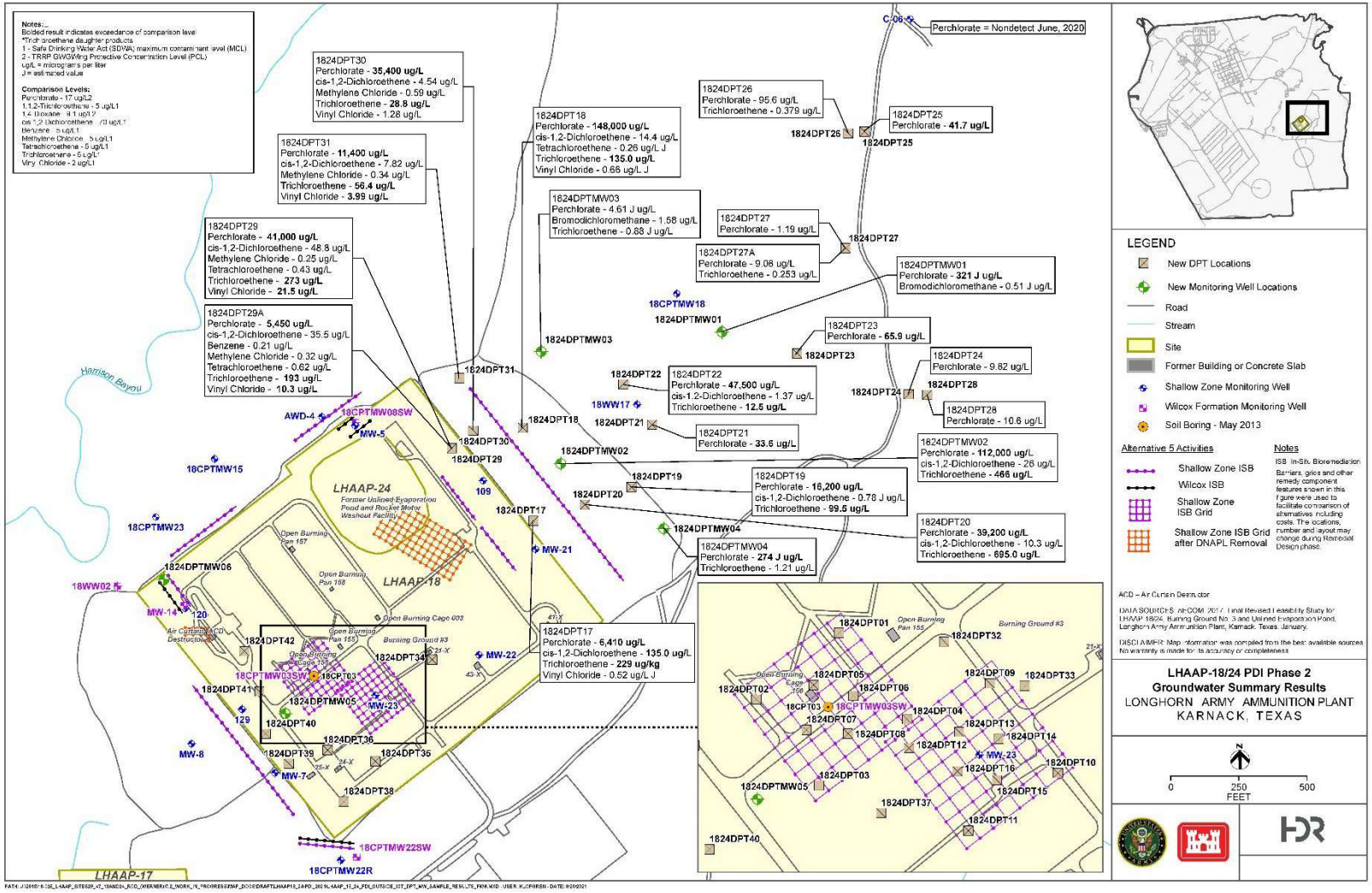
- PDI Field Work Outside the ICT Northeast Boundary, March 2021

  Preliminary Findings - Soil

  - ✓ Perchlorate was detected in 16 out of 17 direct push technology (DPT) boring soil samples collected outside the Northeast ICT Boundary; three at concentrations that exceeded the Texas Commission on Environmental Quality (TCEQ) soil medium-specific concentration (MSC) for industrial use based on groundwater protection (GWP-Ind).
  - ✓ TCE was detected in 7 out of 17 DPT boring soil samples collected outside the Northeast ICT Boundary; one at a concentration that exceeded the MSC GWP-Ind.
  - ✓ Methylene Chloride (MC) was detected in 9 out of 17 DPT boring soil samples collected outside the Northeast ICT Boundary; no samples exceeded the MSC GWP-Ind.
  - ✓ Tetrachloroethene (PCE) was detected in 1 out of 17 DPT boring soil samples collected outside the Northeast ICT Boundary; no samples exceeded the MSC GWP-Ind.

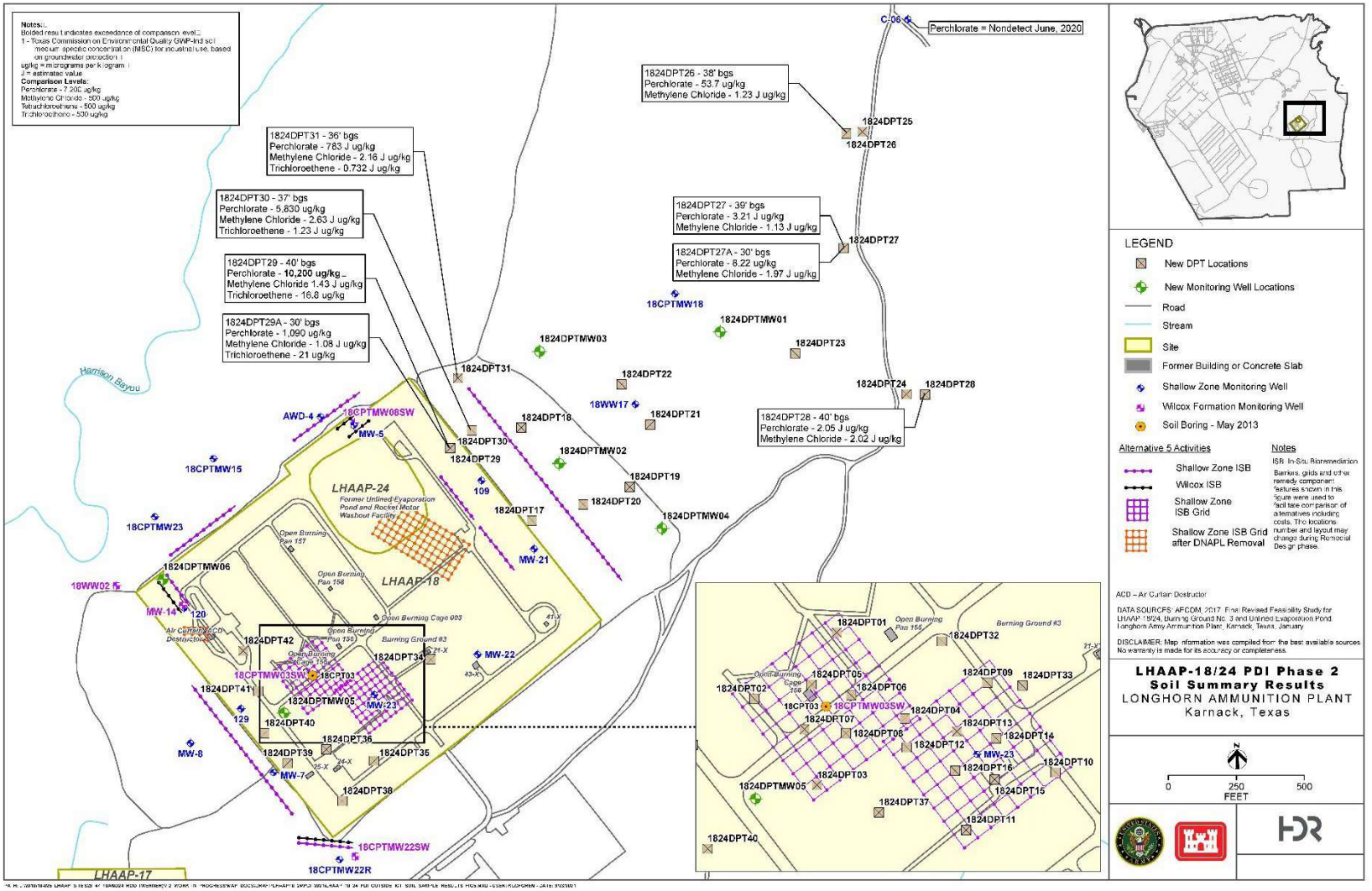
Restoration Advisory Board Meeting

LHAAP-18/24 Phase 2 PDI Field Work – Outside the NE ICT Boundary



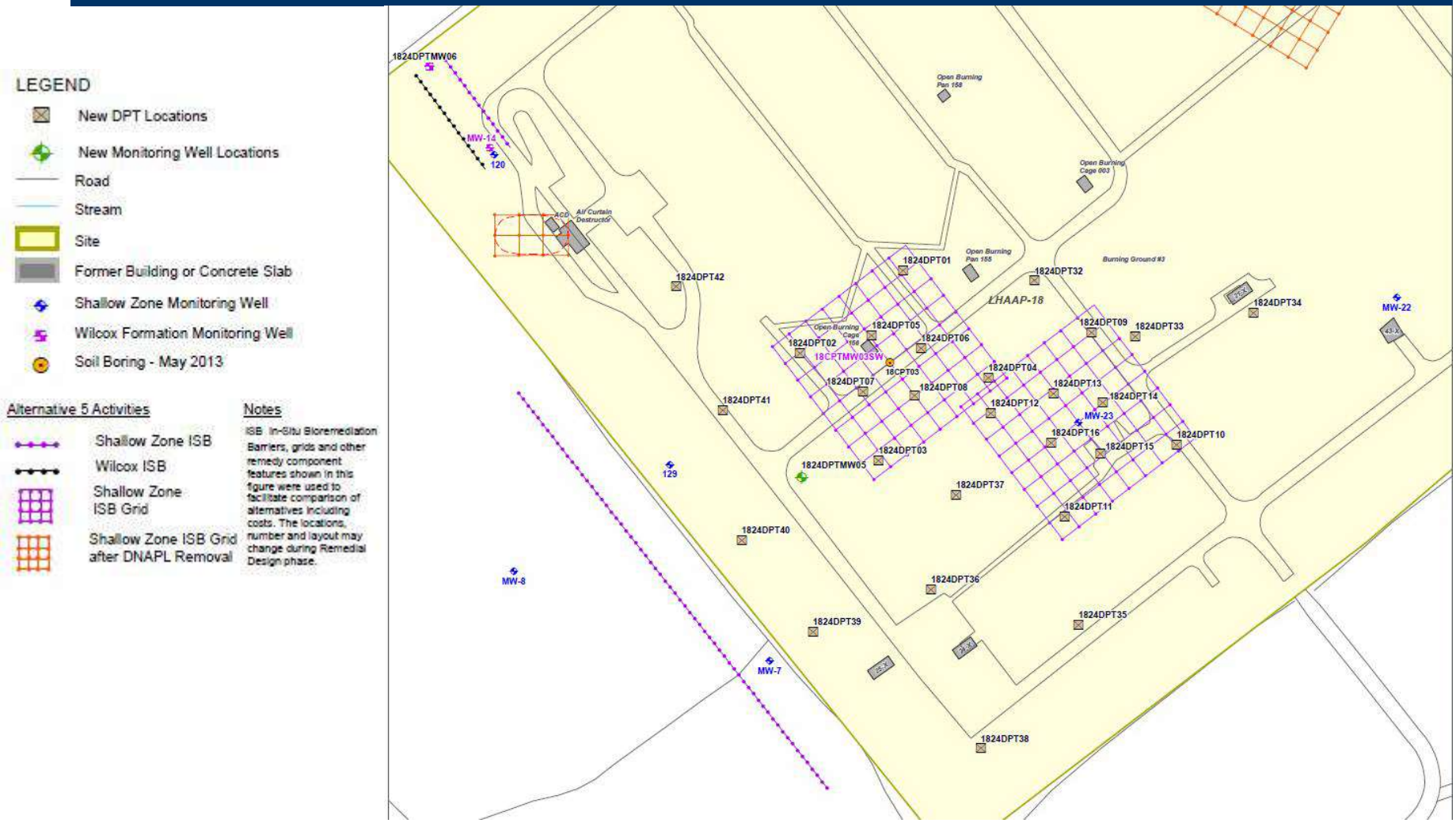
Restoration Advisory Board Meeting

LHAAP-18/24 Phase 2 PDI Field Work – Outside the NE ICT Boundary



Restoration Advisory Board Meeting

DPT and Permanent Well Locations - ISB Grid Area



Restoration Advisory Board Meeting

LHAAP-18/24 Phase 2 PDI Field Work

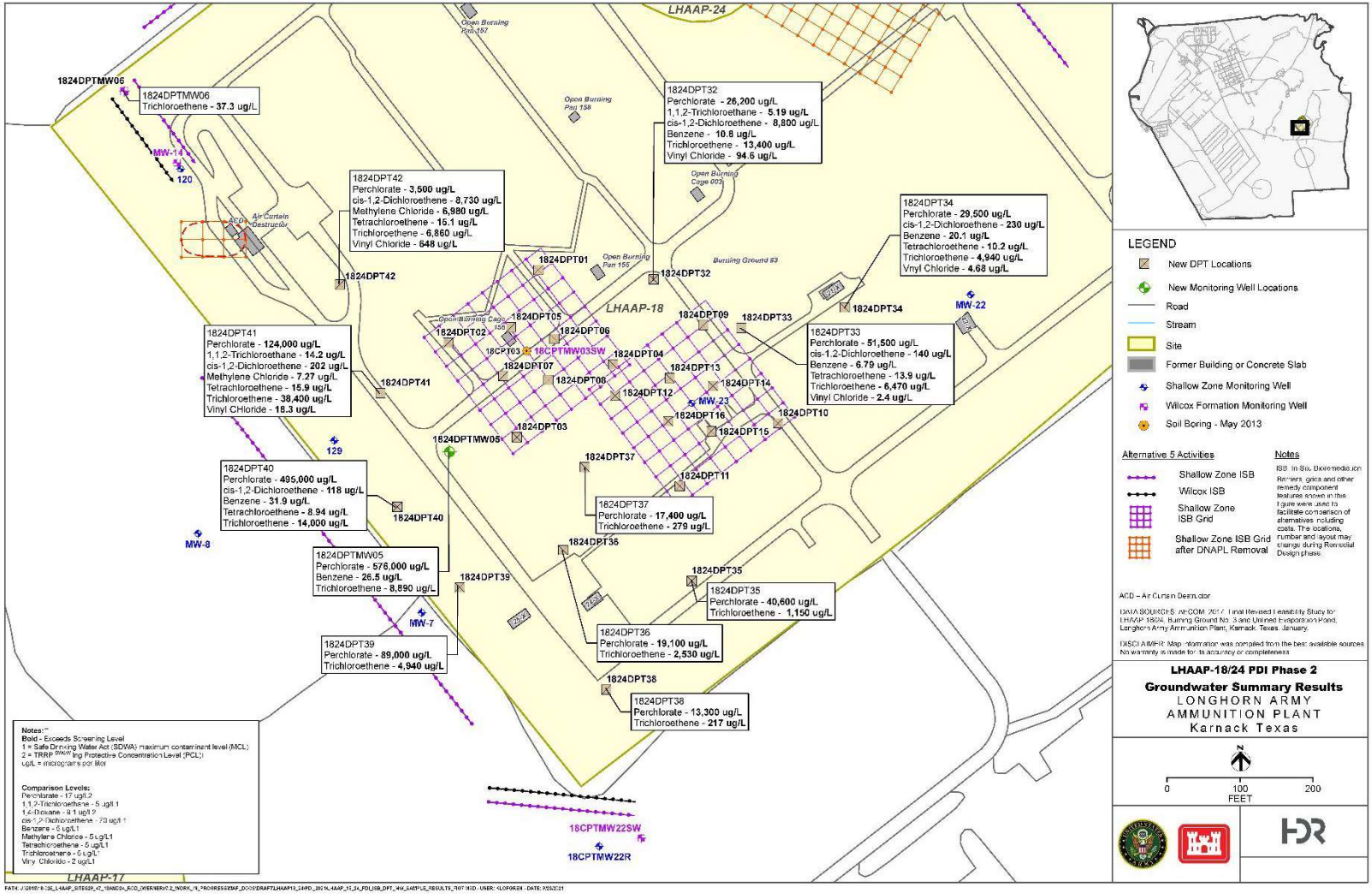
- PDI Field Work Shallow Zone in-situ bioremediation (ISB) Grids, June 2021

Preliminary Findings - Groundwater

- ✓ Perchlorate was detected in 11 out of 11 temporary wells located at concentrations that exceeded the TRRP PCL for $^{GW}GW_{Ing}$.
- ✓ Seven sample concentrations exceeded 20,000 µg/L.
- ✓ Seven VOCs had concentrations that exceeded MCLs at multiple temporary wells.
- ✓ VOCs include 1,1,2-trichloroethane; benzene; cis-1,2-DCE; MC; PCE; TCE; and VC.

Restoration Advisory Board Meeting

LHAAP-18/24 Phase 2 PDI Field Work - Shallow Zone ISB Grids



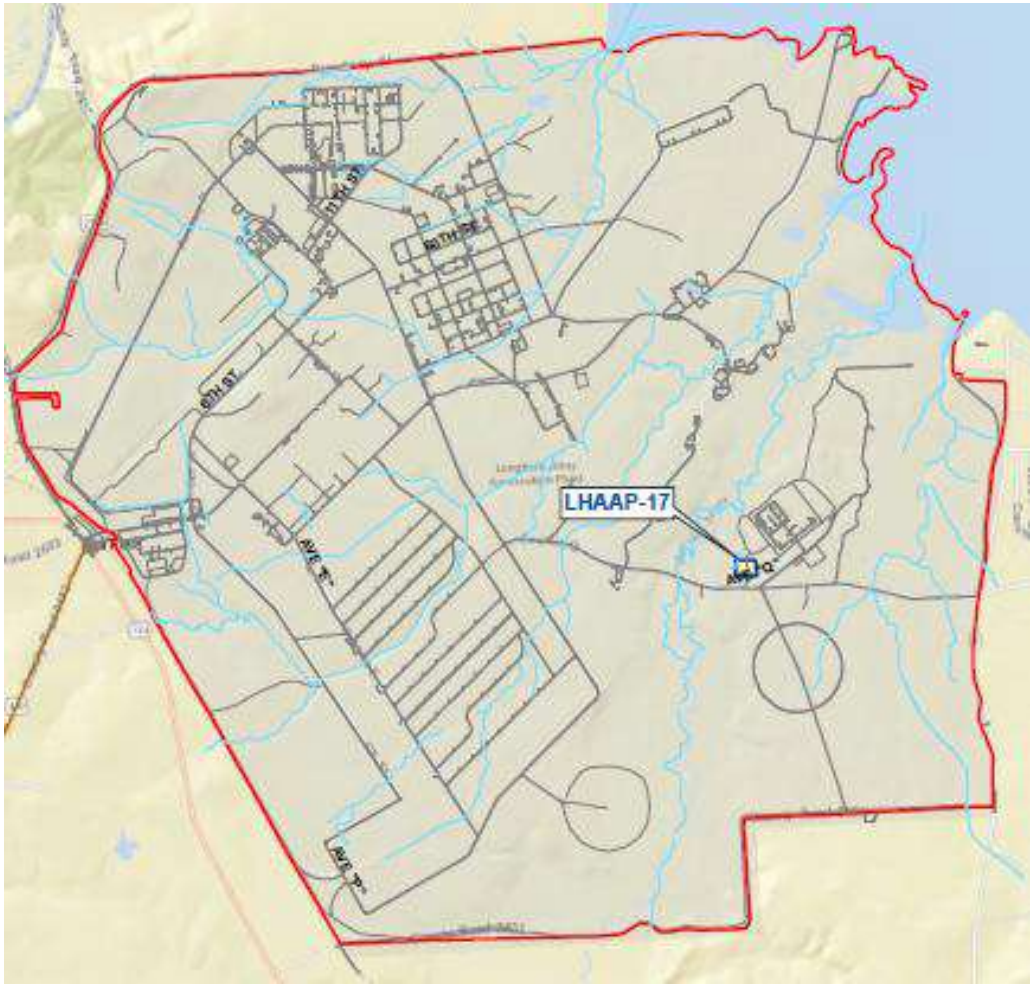
Restoration Advisory Board Meeting

Status of LHAAP-29 PDI Investigation

- ✓ Sample subset sent to a third-party laboratory for explosives analyses in soils revealed capability of achieving detection limits below the soil screening levels for explosives.
- ✓ Second set of soil samples have been submitted for re-analyses for explosives; results due end of October 2021.
- ✓ Second set sample results will be reviewed and used to develop path forward.

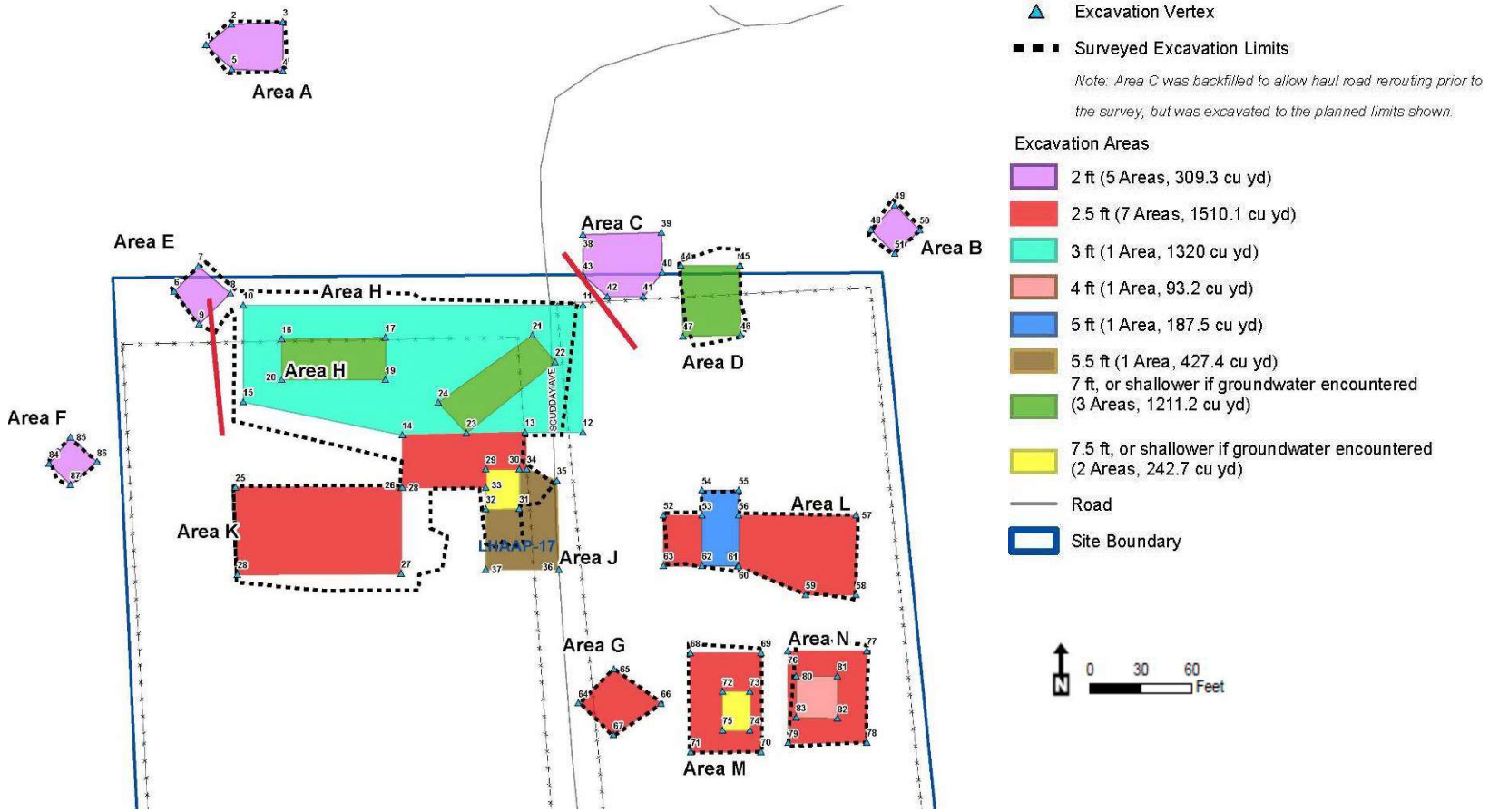
Restoration Advisory Board Meeting

MMG-TLI JV



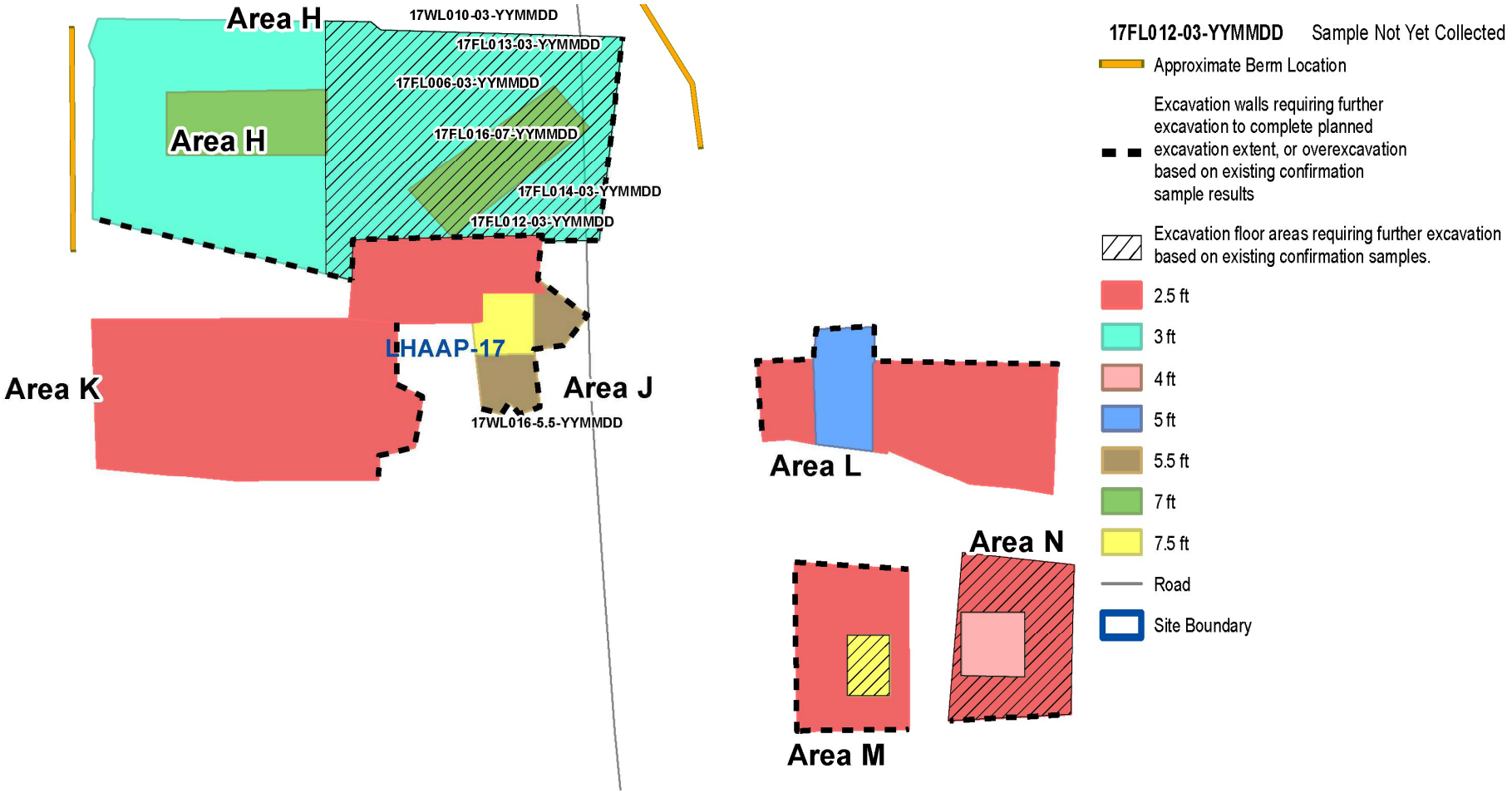
Restoration Advisory Board Meeting

LHAAP-17 Remedial Action-planned/completed to date



Restoration Advisory Board Meeting

LHAAP-17 Remedial Action-to be completed



Restoration Advisory Board Meeting

LHAAP-17 Time Critical Removal Action

- A work stoppage occurred on September 30, 2019, due to the presence of munitions hazards not previously known to be present.
- Munitions and Explosives of Concern (MEC) presents an imminent and substantial threat and a Time Critical Removal Action determined appropriate
- Site preparations have been completed including boundary survey, vegetation removal, and erosion control repair
- Backfill sources have been sampled and approved for use
- Draining of impounded waters has begun

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action

- Work will recommence in accordance with approved plans.
- Major work elements are as follows:
  - Continue draining of impounded water
  - Backfill excavated areas determined to be “clean”
  - Complete site set-up, including placement of a Remotely Operated Screening/Sifting Plant
  - Establish Exclusion Zones (i.e., explosives safety arcs) as needed (using barricades)
  - Complete the excavation of soils while employing robotic earth moving machinery followed by screening/sifting and segregation of soil from debris

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action

- Major work elements continued:
  - Move soil in existing soils stockpiles using robotic earth moving machinery to the remotely operated Screening/Sifting Plant and complete screening/sifting of these soils. This operation will segregate soils from debris.
  - Stage screened/sifted soil on-site in a “cleared” area for off-site disposal
  - Clear the soil surface in all accessible areas of any potential munitions and any metal or debris that may interfere with digital geophysical mapping of the subsurface

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action

- Major work elements continued:
  - Complete digital geophysical mapping to identify subsurface anomalies that may represent munitions (i.e., Targets of Interest or TOI) including in areas from which stockpiles have been removed
  - Dig/remove all identified subsurface TOI
  - Install groundwater extraction system components when it is safe to do so

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action

- Major work elements continued:
  - Move debris using robotic equipment to a "Material Potentially Presenting an Explosive Hazard (MPPEH)" Processing Area where debris will be segregated into:
    - MEC
    - Material Documented as Safe (MDAS)
    - Other Debris
  - Temporarily store any recovered munitions (termed MEC) for later disposal by detonation on-site

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action

- Major work elements continued:
  - Inspect all munitions related debris to verify no explosive hazard remains and document as safe (termed as MDAS) and temporarily store for later disposal off-site by a qualified vendor who will provide a certificate of destruction
  - Temporarily store all non-munitions related debris for off-site disposal
  - Dispose of accumulated MEC by on-site consolidated shot

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action

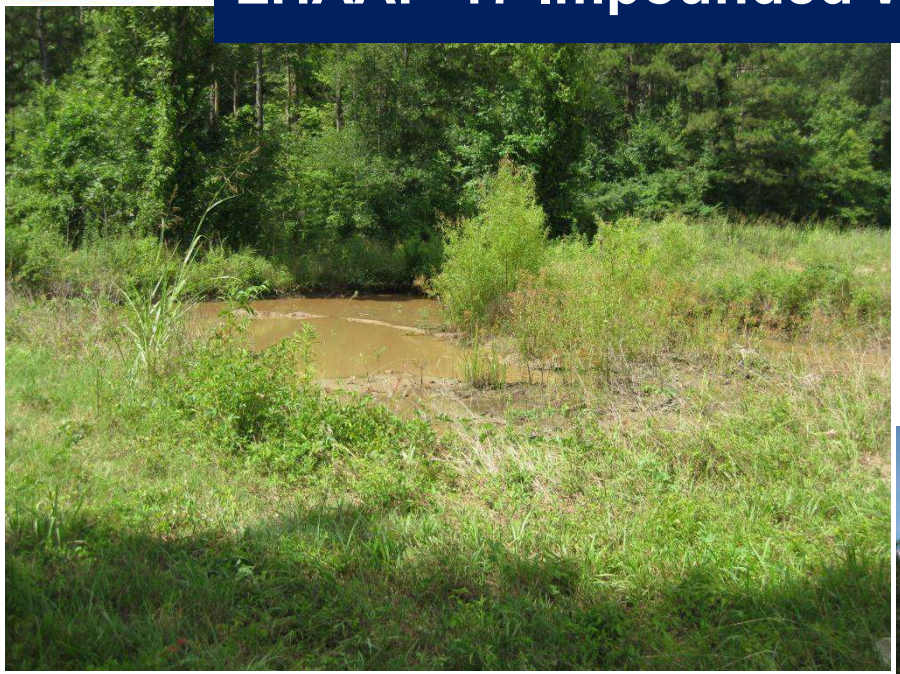
- Major work elements continued:
  - Complete sampling at locations where MEC is recovered and where it is detonated
  - Complete sampling within excavations as needed to verify remediation goals are achieved
  - Complete site restoration throughout the field work

Restoration Advisory Board Meeting

LHAAP-17 Site Layout

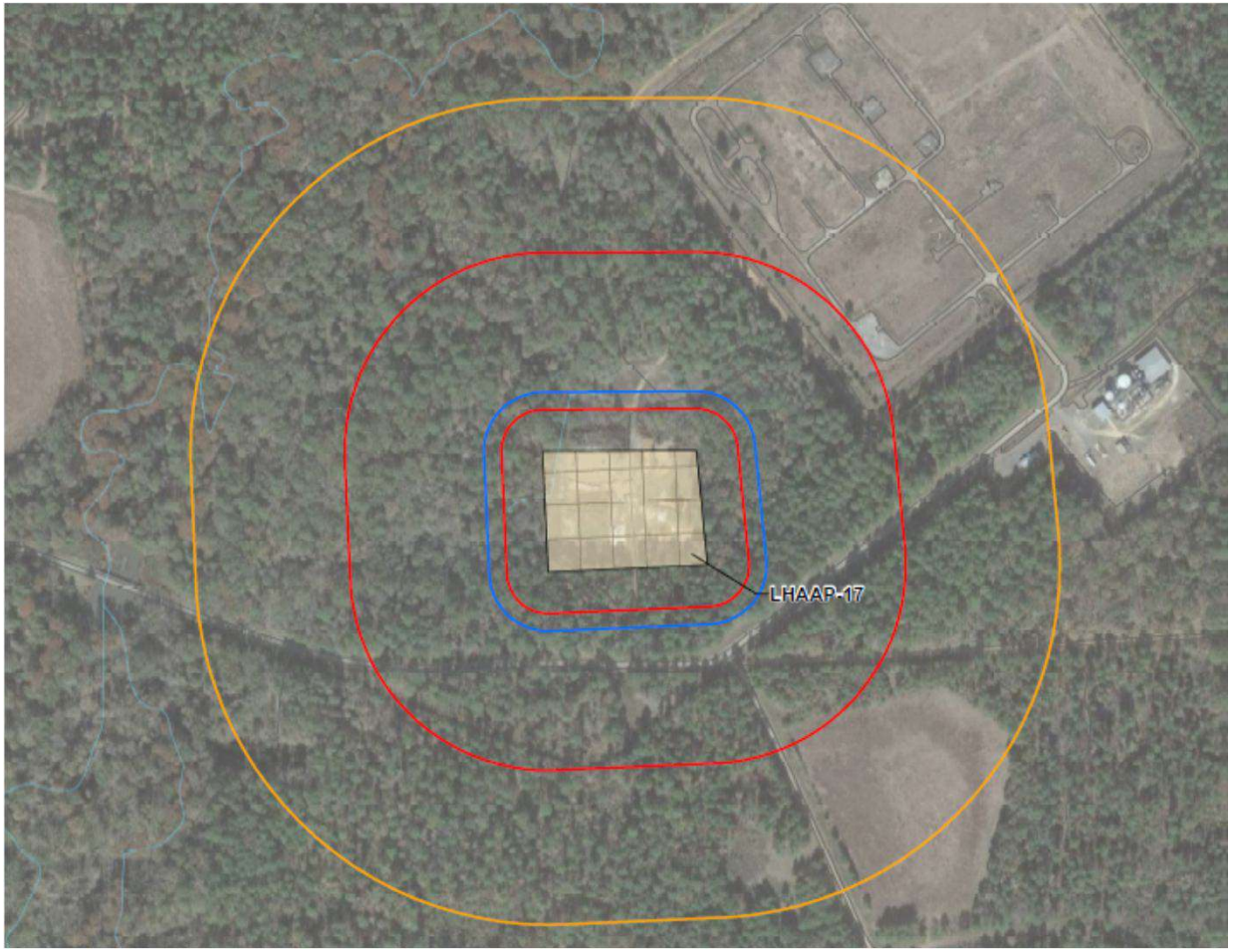
Restoration Advisory Board Meeting

LHAAP-17 Impounded Water in Open Excavations



Restoration Advisory Board Meeting

LHAAP-17 Explosives Safety Exclusion Zones



Restoration Advisory Board Meeting

LHAAP-17 Screening/Sifting

Next RAB Meeting Schedule & Closing Remarks

- Schedule January 2022 RAB Meeting
- Other Issues/Remarks
- Thank you for coming

Groundwater Treatment Plant - Processed Groundwater Volumes

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

Processed Water Discharged Data (in gallons)

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

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

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

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

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

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

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

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

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

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

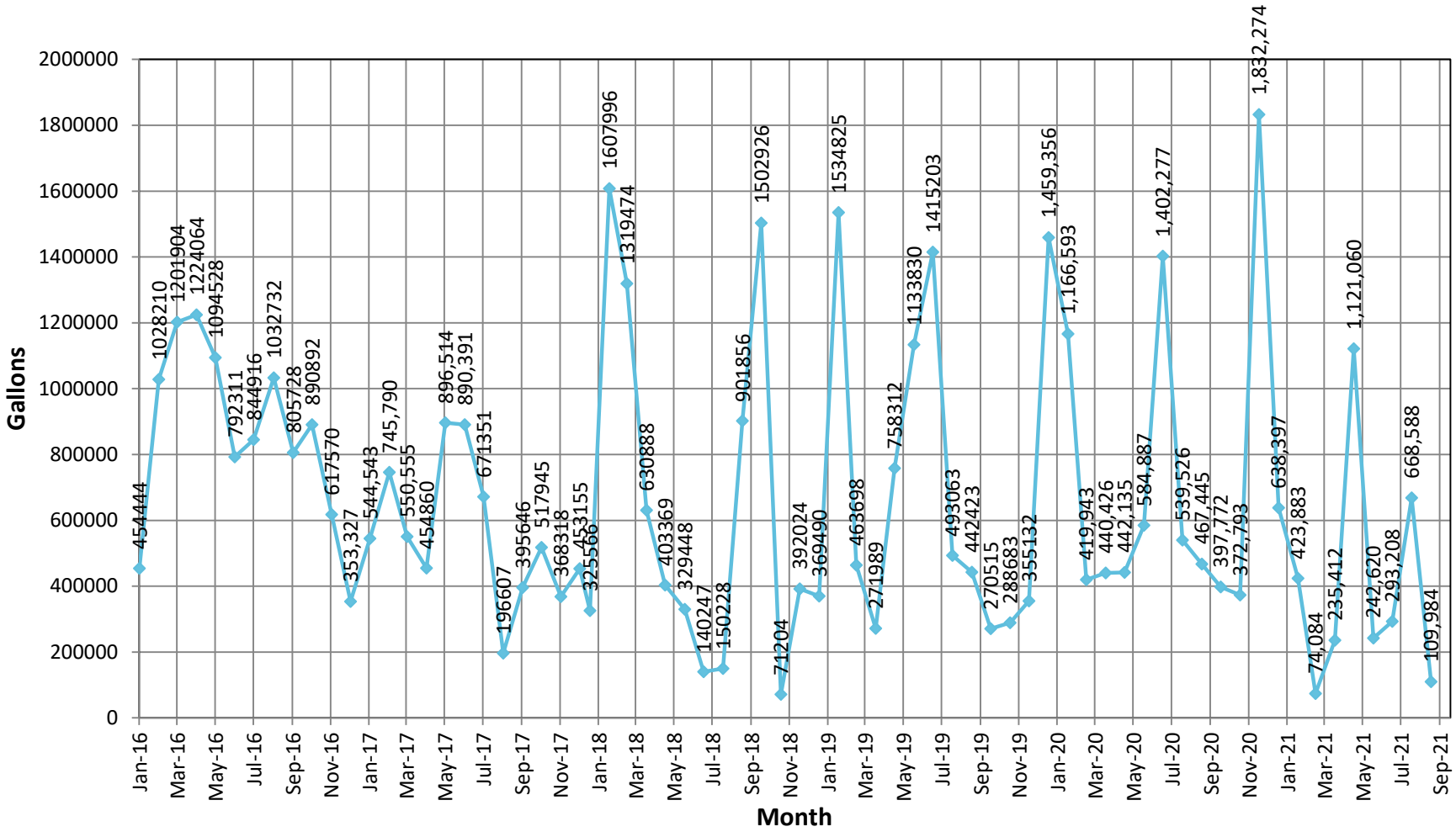
Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul - 18	Aug-18	Sep-18
517,945	368,318	453,155	325,566	1,607,996	1,319,474	630,888	403,369	329,448	140,247	150,228	901,856

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

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

Oct-20	Nov-20	Dec-20	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

*Indicates Estimate


Treated Groundwater Discharged Monthly
from December 2014 through September 2021
Gallons
Month
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Jan-18
Mar-18
May-18
Jul-18
Sep-18
Nov-18
Jan-19
Mar-19
May-19
Jul-19
Sep-19
Nov-19
Jan-20
Mar-20
May-20
Jul-20
Sep-20
Nov-20
Jan-21
Mar-21
May-21
Jul-21
Sep-21
454444
1028210
1201904
1224064
1094528
792311
844916
1032732
805728
890892
617570
353,327
544,543
745,790
550,555
454860
896,514
890,391
671351
196607
395646
517945
368318
453155
325566
1607996
1319474
630888
403369
329448
140247
150228
901856
1502926
71204
392024
369490
1534825
463698
271989
758312
1133830
1415203
493063
442423
270515
288683
355132
1,459,356
1,166,593
419,943
440,426
442,135
584,887
1,402,277
539,526
467,445
397,772
372,793
1,832,274
638,397
423,883
74,084
235,412
1,121,060
242,620
293,208
668,588
109,984

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

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Sep-19	0	0	442,423	0	0
Oct-19	0	0	270,515	0	0
Nov-19	115,503	0	173,180	0	0
Dec-19	318,248	0	36,884	0	0
Jan-20	1,459,396	0	0	1,115,183	0
Feb-20	1,166,593	0	0	741,954	0
Mar-20	419,943	0	0	0	0
Apr-20	440,426	0	0	0	0
May-20	442,135	0	0	0	0
June-20	584,887	0	0	0	0
July-20	1,402,277	0	0	984,393	0
Aug-20	216,197	0	323,359	0	0
Sep-20	0	0	467,445	0	0
Oct-20	0	0	397,772	0	0
Nov-20	0	0	372,793	0	0
Dec-20	1,832,274	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

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

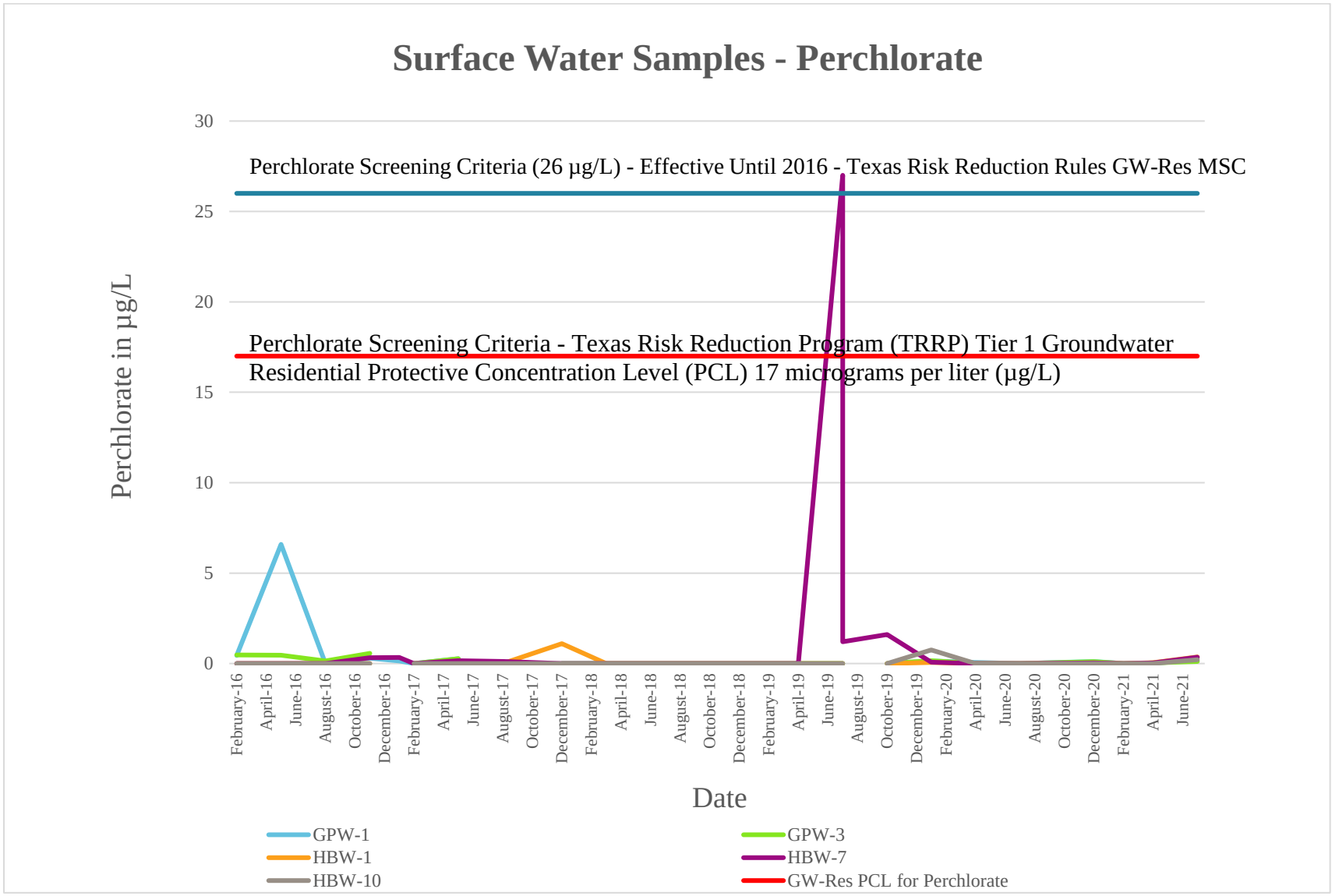
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
Creek Sample ID	**Feb 2016**	**May 2016**	**Aug 2016**	**Nov 2016**	**Feb 2017**	**May 2017**	**Aug 2017**	**Dec 2017**	**Mar 2018**	**Jun 2018**	**Aug 2018**
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	Dry	<2.0 U	<2.0 U	Dry	<2.0 U
GPW-3	0.474	0.457	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
Creek Sample ID	**Oct 2018**	**Jan 2019**	**Apr 2019**	**Jul 2019**	**Oct 2019**	**Jan 2020**	**Apr 2020**	**Jul 2020**
GPW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.163	0.0589 J	<0.05 U
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
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
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
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

Quarter	4th	1st	2nd	3rd
Creek Sample ID	**Dec 2020**	**Feb 2021**	**Apr 2021**	**Jul 2021**
GPW-1	0.110	<0.05 U	0.0268 J	0.154
GPW-3	0.108	<0.05 U	0.0321 J	0.122
HBW-1	0.0374 J	<0.05 U	0.0410 J	0.369
HBW-7	0.0265 J	<0.05 U	0.0373 J	0.348
HBW-10	<0.05 U	<0.05 U	<0.05 U	0.207

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