Subject:	**Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Karnack Community Center, Karnack, Texas**
Date of Meeting:	**January 21, 2016, 6:00 – 7:00 PM**

Meeting Participants:

LHAAP/BRAC:	Rose M. Zeiler
USACE:	Aaron Williams, Richard Smith
USAEC:	Nicholas Smith
AECOM:	Mark Heaston, Marwan Salameh, Debra Richmann
TCEQ:	April Palmie
USEPA Region 6:	Rich Mayer, Kent Becher (USGS liaison),
USFWS:	Paul Bruckwicki
RAB:	**Present:** Paul Fortune, Charles Dixon, Judy Vandeventer, Tom Walker, Carol Fortune, Richard LeTourneau, Nigel R. Shivers, Terry Britt **Absent:** Ken Burkhalter, Robert Cargill, Lee Guice, Judith Johnson, Ted Kurz, James Lambright, Pickens Winters, John Pollard, Jr.
Public:	Dan Murphy, Dawn Orsak (CLI-TAG), Mark Shepperd, Mike McComb, Erik Ducough

An agenda for the RAB meeting, three handouts (Groundwater Treatment Plant [GWTP] Treated Groundwater Volumes, Surface Water Sampling Results, and LHAAP Perimeter Well Sampling Results), and a color copy of the AECOM slide presentation were provided to meeting attendees.

Welcome and Introduction

The RAB Community Co-Chair (Paul Fortune) called the meeting to order and asked if there was anyone present that had not attended before. Dan Murphy and Mark Sheppard introduced themselves, as did Debra Richmann who is replacing Mark Heaston as the AECOM Project Manager.

Open Items - Dr. Rose M. Zeiler

RAB Administrative Issues

Minutes

Dr. Zeiler asked Mark Heaston about the current status of the October 2015 RAB minutes. Mark responded that AECOM was late issuing them, but they would be distributed to the RAB members soon.

Website Update

Dr. Zeiler asked Mark if he had visited the website to see if there has been any increase in usage since the RAB questionnaires were distributed. One of the common responses on the questionnaire was that most people were not aware of the RAB. Mark indicated he had not done so yet. The RAB minutes from the June 2015 meeting and the agenda for this January 2016 RAB meeting are currently posted on the website. It also has a calendar showing when and where upcoming sampling events at Longhorn will happen.

RAB Membership Drive and LHAAP Community Involvement Questionnaire

Dr. Zeiler explained that the questionnaires that were sent to the community recently will be used to evaluate the need to update the current Community Relations Plan (CRP). Based on the responses received, the Army will determine if the current plan is adequately achieving the community involvement objectives. Dr. Zeiler indicated many responses to questions about the RAB indicate that many people are unaware that it even exists. So, the Army is trying to better communicate to the public what the RAB does and where and when RAB meetings will be held. The Army posted fliers/notices for this meeting in a variety of public places and engaged several local radio stations to broadcast a public service announcement for the current RAB meeting. It was confirmed that at least the local Karnack station did. Dr. Zeiler indicated that the Army is continuing its review of the questionnaire responses and will provide a summary at the next RAB meeting. She also said that at this point in the review, it does not appear there is a need to revise the existing CRP. Dr. Zeiler asked the attendees if there were any other administrative issues they wanted to discuss; none were identified.

Defense Environmental Restoration Program (DERP) Update – AECOM (Mark Heaston)

Before beginning this part of the presentation, Dr. Zeiler asked Mark to provide some details on the active sites, especially for the new people in the audience. The Longhorn Map (Slide 5) was projected on the screen, but it was difficult to discern some of the sites, so as Mark described each of the individual sites on the Active Site List (Slide 6), Dr. Zeiler pointed them out on a larger map on the wall.

MNA Site Updates (LHAAP-37, 46, 50, 58, 67)

- Completed LUC boundary surveys and deed recordation for all sites. The purpose of the LUCs is to restrict use of groundwater in order to protect human health and the environment.
- RACRs for LHAAP-46 and LHAAP-58 are complete (Final).
- Work on the RACRs for LHAAP-37, LHAAP-50 and LHAAP-67 is in progress and is expected to be completed within the next few months.
- Draft Year 1 Remedial Action Operation (RA-O) reports have been completed for all MNA sites, except LHAAP-37 and Year 2 RA-O reports for LHAAP-46, -58, and -67 are being prepared.
- Quarterly/Semi-Annual groundwater sampling and analysis is continuing at all of the MNA sites except LHAAP-37. Groundwater sampling is performed on a quarterly basis for the first 2 years of RA-O, and semi-annually thereafter.
- LHAAP-37 is generally lagging behind the other MNA sites due to the Bio-Plug study conducted there. Currently the groundwater at LHAAP-37 is being monitored for geochemical rebound. After the rebound study is completed and groundwater returns to pre-BioPlug study conditions, RA-O monitoring will begin.

LHAAP-29 Update

- Work at this site has been delayed due to the dispute. However, additional field investigation to determine the extent of DNAPL has been completed. The DNAPL pool is smaller than expected; important information needed to support the FS and Remedial Design, because the contaminant mass determines how much remediation is required, which affects the cost and effectiveness of the remedy. The findings of the supplemental investigation have been documented in an RI Addendum, which is currently being reviewed by the Army.

LHAAP-18/24 Update

Mark began by stating that LHAAP-18/24 is the largest and one of the most complex sites at LHAAP.

Dr. Zeiler said that the sampling for 1,4-dioxane discussed at the previous (October 2016) RAB meeting has been completed recently. The Army looked for the compound at LHAAP for nearly 2 decades, but did not detect it at unacceptable levels. However, groundwater standards for 1,4-dioxane have been lowered, so EPA and TCEQ asked the Army to look for it again. In the most recent sampling at LHAAP-18/24 (completed in December 2015), 1,4-dioxane was identified above the industrial groundwater standard in shallow groundwater samples collected from a small area in the western corner of LHAAP-18. Dr. Zeiler continued that although it is not going to be a major issue, it is now considered a COC, so will need to be addressed in the revised FS.

Mark said that additional data gap sampling will be performed at the site to get a better understanding of the extent of 1,4-dioxane and other COCs (perchlorate, DNAPL) in site groundwater. This will allow the Army to evaluate additional potentially applicable remedial technologies in a revised FS.

Dr. Zeiler stated that LHAAP-18/24 is the worst site at LHAAP. The GWTP was designed and built for this site and was used later to treat groundwater from LHAAP-16.

Rich Mayer suggested that the GWTP might also be used for other sites such as LHAAP-17. Slide 11 presents the amount of water collected and treated through June 2015. The amount of water treated during the second quarter was larger than during the first quarter.

Mark reviewed the sites listed on Slide 9, which are the sites where work is on hold due to the Dispute.

Groundwater Treatment Plant (GWTP) Update

Mark and Marwan Salameh went through the routine operations and maintenance associated with the GWTP (Slide 10) and Marwan discussed the volume of water treated at the GWTP on a monthly basis through time. The volume dropped in September due to the shutdown of the plant because the blower malfunctioned. During this period, the other treatment technologies remained active and use of the ICTs alternated to minimize potential impacts.

Nigel Shivers asked if there is a correlation between the treated water volume and rainfall; Mark responded that there are seasonal fluctuations.

Surface Water and Perimeter Well Sampling

Mark discussed the surface water sampling results shown in Slide 12 and directed the attendees to refer to the surface water handout with the perchlorate data. The main takeaways from the slide are that perchlorate concentrations have not exceeded the TCEQ residential groundwater medium specific concentration (MSC) in surface water samples collected from May 2009 through November 2015, and for the last 2 years or so of sampling, perchlorate has not been detected in any samples.

Other Environmental Restoration Issues – Dr. Zeiler

LHAAP – 47 Soil Cover

Marwan and Mark described the soil cover repairs that were completed at LHAAP-47 (Slide 13).

Dr. Zeiler described how the Army repaired a cover that Army had placed over perchlorate-contaminated soil at LHAAP-47 over a decade ago to prevent erosion and transport of perchlorate in the soil to a drainage downslope of the site. She recalled that subsequent to a soil

removal action at LHAAP-50 about 2 years ago, surface water sampling was conducted to evaluate the soil removal action. It was necessary to identify any potential contribution from the perchlorate-contaminated soil (under the cover) at Site 47. Because perchlorate was detected in the drainage downslope of Site 47 (although below unacceptable levels) Army inspected the liner at Site 47 and found some damaged areas. AECOM repaired the damaged liner at LHAAP-47 by placing an approximate 100 ft x 30 ft sheet of HDPE over the damaged liner/exposed soil, covering it with a 6-inch topsoil layer, and re-seeding it. Surface soil samples were collected between the liner and the creek; COCs were detected, but at low concentrations. The ROD that includes a removal of the perchlorate contaminated soil under the damaged liner at LHAAP-47 is on hold due to the dispute.

1,4-Dioxane

Mark provided an update on 1,4-dioxin sampling (Slide 14), In addition to the information presented on the slide, he explained that 1,4-dioxane was used as a stabilizer in TCE so, the two compounds are frequently found together. Sampling for 1,4-dioxane has therefore only been performed at LHAAP sites with a history of chlorinate solvent use (LHAAP-03, -12, -16, -17, --29, -37, -46, -50, -58, and -67). He reiterated that the extent of 1,4-dioxane at LHAAP-18 groundwater is limited to the western corner of the site.

Dr. Zeiler went on to explain a little more about 1,4-dioxane; she said it has a specific gravity similar to water, so it isn't a "sinker" like TCE, even though the two compounds are often co-located. She also said the Army will look into developing a contingent remedy for 1,4-dioxane to address the limited area in which it occurs in shallow groundwater at LHAAP-18.

Judy Vandeventer asked if the Army has received the 1,4-dioxane sampling results yet. Dr. Zeiler responded that the Army has received them and that they have just been provided to the regulators. Marwan added that the highest concentration detected is 231µg/L.

Charles Dixon wanted to know if 1,4-dioxane is a bio-hazard and what affect it might have on Caddo Lake. No one responded with information concerning potential environmental impacts of 1,4-dioxane.

Rich indicated that EPA collected and analyzed samples from two wells used for drinking water and that the water quality is fine. Mark Sheppard asked where the wells are located. Paul Fortune and Dr. Zeiler pointed them out on the wall map; they are located along the northern boundary of LHAAP, upgradient of Caddo Lake.

Terry Britt said that TCEQ also tested groundwater samples in the past, but not samples from the distribution system. Someone mentioned the contaminated public water supply in Flint Michigan. Mark (Sheppard) stated that the drinking water wells in this area are under high pressure, so it is difficult to contaminate them. Also, the Army samples wells along the installation boundary.

Mike McComb asked Dr. Zeiler what direction the groundwater is flowing; she replied that it generally flows toward surface water bodies and eventually to Caddo Lake. Dr. Zeiler also said

that the Army is carefully monitoring shallow and intermediate groundwater at LHAAP-46, which is closest site to the installation boundary with groundwater contamination. The shallow groundwater is the most highly contaminated zone.

April Palmie asked Dr. Zeiler to discuss the depths of the LHAAP monitoring wells compared to the public water supply wells. Dr. Zeiler responded that the shallow wells are typically about 25 ft deep and currently are dry at LHAAP-46, and the intermediate wells are generally between 40 ft and 50 ft deep. Terry Britt, who is a member of the Board of Caddo Lake Water Supply Corporation, stated that the drinking water wells are much deeper than the contaminated groundwater zones. The well screens start at least 150 ft lower.

Richard LeTourneau asked if the 1,4-dioxane results will be discussed at the next RAB meeting. Dr. Zeiler responded that they would be if the RAB members want to see them, and also indicated that the Army will prepare a Fact Sheet to hand out at the meeting. It was also noted that the results from the second round of confirmation sampling at LHAAP-18/24 will probably not be included, because that sampling won't happen until March.

CRP/CIP Questionnaire

Mark and Dr. Zeiler discussed the distribution and responses to the CIP questionnaires that were mailed out to more than 1,500 addresses in the Karnack and Uncertain, TX zip codes on October 30th, shortly after the last RAB meeting. Mark described how he conducted the bulk mailing and indicated that the cut-off for responses was set at the end of December. Dr. Zeiler said many responses indicated that the respondents were completely unaware that the RAB exists. To increase awareness, the Army implemented several of the suggestions contained in the 71 questionnaires returned from the community. For example, the Army prepared a public service announcement for this RAB to be aired on the radio and provided it to three local radio stations, including KMHT in Marshall and two stations in Shreveport. Monthly notices are also published in the newspaper and for this RAB, notices were also posted at the post office and general store. Mark indicated that only 15 individuals who responded to the questionnaire provided mailing addresses; those people were mailed individual RAB announcements and will continue to mailed announcements going forward. One of the new attendees, Mike McComb, indicated that the letter he received for this RAB was the most effective means of communication from his perspective. Paul also suggested that notices for future RABs be posted at the Caddo Lake Institute.

Dispute Status Update

Dr. Zeiler indicated there were no new developments on the dispute.

Next RAB Meeting Schedule and Closing Remarks

The next RAB meeting will be on **April 21, 2016** at the same place and time. She then opened the meeting up for any questions from the attendees.

- Dan Murphy asked how long it takes to clean up the groundwater plumes. Dr. Zeiler responded that most of the COCs at Longhorn are VOCs, which require a long time to clean up. As an example, she discussed the bio-plug study at LHAAP-37 where a pilot test was performed by injecting air, nutrients, and microbes on a 6-ft spacing to enhance bio-degradation of VOCs. The test was performed over a 2-year period, but ultimately it didn't work.

  She also indicated the Army considers achievement of Remedy in Place (RIP) a major milestone in the cleanup process, and that is typically followed by a period of RA-O and associated long-term monitoring for effectiveness.

- Paul invited the new visitors to join the RAB and asked if there is an application posted on the website.

- Dr. Zeiler asked for any requests for topics to be included in the next RAB meeting:

  - Recap status/activities at LHAAP-29
  - Review 1,4-dioxane results for LHAAP-18/24

Adjourn – Motion to adjourn made by Judy Vandeventer, seconded by Carol.

October Meeting Attachments and Handouts:

- Meeting Agenda
- AECOM PowerPoint Presentation
- GWTP Treated Groundwater Volumes Handout
- Surface Water Sampling Results Handout
- LHAAP Perimeter Well Sampling Results Handout

Acronyms

AECOM	AECOM Technical Services, Inc.
BRAC	Base Realignment and Closure
CIP	Community Involvement Plan
CLI	Caddo Lake Institute
COC	Contaminant of Concern
CRP	Community Relations Plan
DERP	Defense Environment Response Program
DNAPL	Dense Non-Aqueous Phase Liquid
FS	Feasibility Study
ft	foot/feet
GWTP	Groundwater Treatment Plant
HDPE	High-Density Polyethylene
ICTs	Interceptor Collection Trench
LHAAP	Longhorn Army Ammunition Plant
LUC	Land Use Control
MNA	Monitored Natural Attenuation
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RA-O	Remedial Action Operations
RI	Remedial Investigation
RIP	Remedy in Place
ROD	Record of Decision
TAG	Technical Assistance Grant
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds

LONGHORN ARMY AMMUNITION PLANT
RESTORATION ADVISORY BOARD
Karnack, Texas
(479) 635-0110

AGENDA

DATE:	Thursday, January 21, 2016
TIME:	6:00 – 7:30 PM
PLACE:	Karnack Community Center, Karnack, Texas

06:00 Welcome and Introduction

06:05 Open Items {RMZ}
- RAB Administrative Issues
- Minutes
- Website

06:15 Defense Environmental Restoration Program (DERP) Update {AECOM}
- MNA Site Updates
- LHAAP-29 Updates
- LHAAP-18/24 Updates
- Groundwater Treatment Plant (GWTP) Update
- Surface Water and Perimeter Well Sampling

07:15 Other Environmental Restoration Issues {RMZ}
- LHAAP-47 Soil Cover
- 1,4-Dioxane
- CRP/CIP Questionnaire
- Dispute Status Update

07:20 Next RAB Meeting Schedule and Closing Remarks

07:30 Adjourn {RMZ}

Longhorn Army Ammunition Plant Restoration Advisory Board Meeting January 21, 2016

AECOM Environment

Agenda

AGENDA

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07:30 Adjourn {RMZ}

RAB Administrative Issues

- Minutes from June RAB Meetings
- Website Updates

Website update

- June 2015 RAB minutes posted
- January 2016 RAB Agenda posted
- Calendar updated with upcoming sampling events

Longhorn Map

AECOM

Longhorn Active Site List

LHAAP-03	Building 722 Paint Shop
LHAAP-04	Pilot Wastewater Treatment Plant
LHAAP-12	Landfill 12
LHAAP-16	Landfill 16
LHAAP-17	Burning Ground No.2/Flashing Area
LHAAP-18	Burning Ground No.3
LHAAP-24	Unlined Evaporation Pond
LHAAP-29	Former TNT Production Area
LHAAP-37	Chemical Laboratory Waste Pad
LHAAP-46	Plant Area 2
LHAAP-47	Plant Area 3
LHAAP-50	Former Sump Water Tank
LHAAP-58	Maintenance Complex
LHAAP-67	Aboveground Storage Tank Farm
LHAAP-001-R-01	South Test Area/Bomb Test Area
LHAAP-003-R-01	Ground Signal Test Area

Status of Environmental Sites

- Monitored Natural Attenuation Sites
  - LHAAP-35B (37) – Chemical Laboratory
  - LHAAP-46 – Plant Area 2
  - LHAAP-50 – Former Sump Water Tank
  - LHAAP-35A (58) – Shops Area
  - LHAAP-67 – Aboveground Storage Tank Farm
- Land Use Control Boundary Surveys for groundwater use restriction are complete for all sites.
- Final Completion Reports are finished for LHAAP-46 and 58, working to finalize Completion Reports for LHAAP-35B(37), 50, and 67.
- Year 1 Remedial Action Operation Reports for sites have been drafted (all sites except LHAAP-35B(37))
- Year 2 RAO Reports have been drafted for LHAAP-46, 58, and 67
- Scheduled Quarterly/Semi-Annual Groundwater Monitoring is ongoing (all sites except LHAAP-35B (37))

Status of Environmental Sites (continued)

LHAAP-29 Former TNT Production Area

To address remedy design and implementation questions at the Draft Final ROD stage, the RI and FS were re-opened:

– RI Addendum for 29 has been submitted for Army Review

LHAAP-18/24 Former Burning Ground No. 3 and Unlined Evaporation Pond

To evaluate remedy alternatives for this site a Revised FS is being prepared:

– Recently completed expanded 1,4-dioxane sampling
– Preparing to perform additional data gap investigation
– Above information will be used to help prepare a revised FS for the site

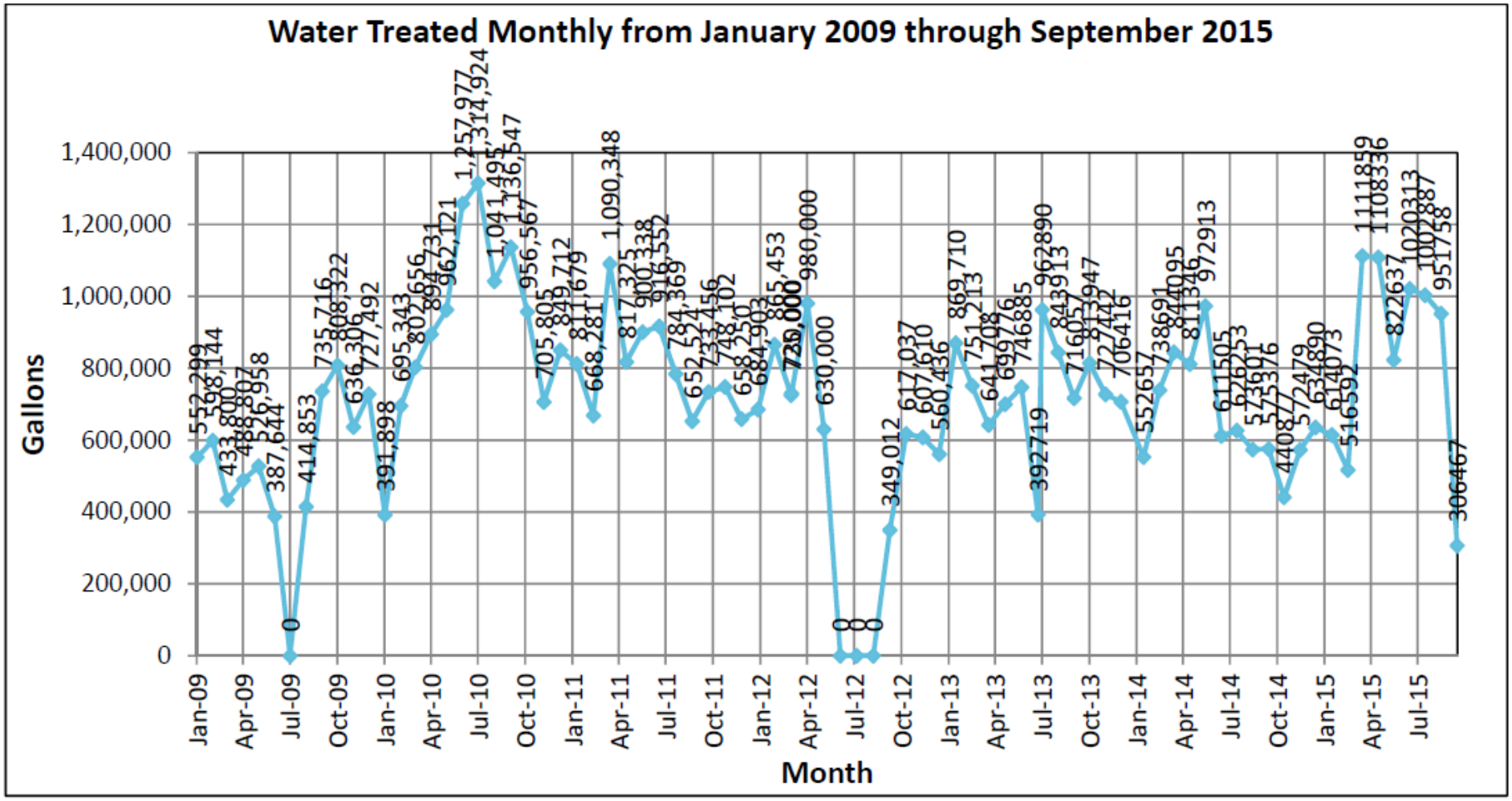
Status of Environmental Sites (cont)

- LHAAP-03 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-04 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-16 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-17 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-47 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-001-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-003-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute

Groundwater Treatment Plant Operations and Management

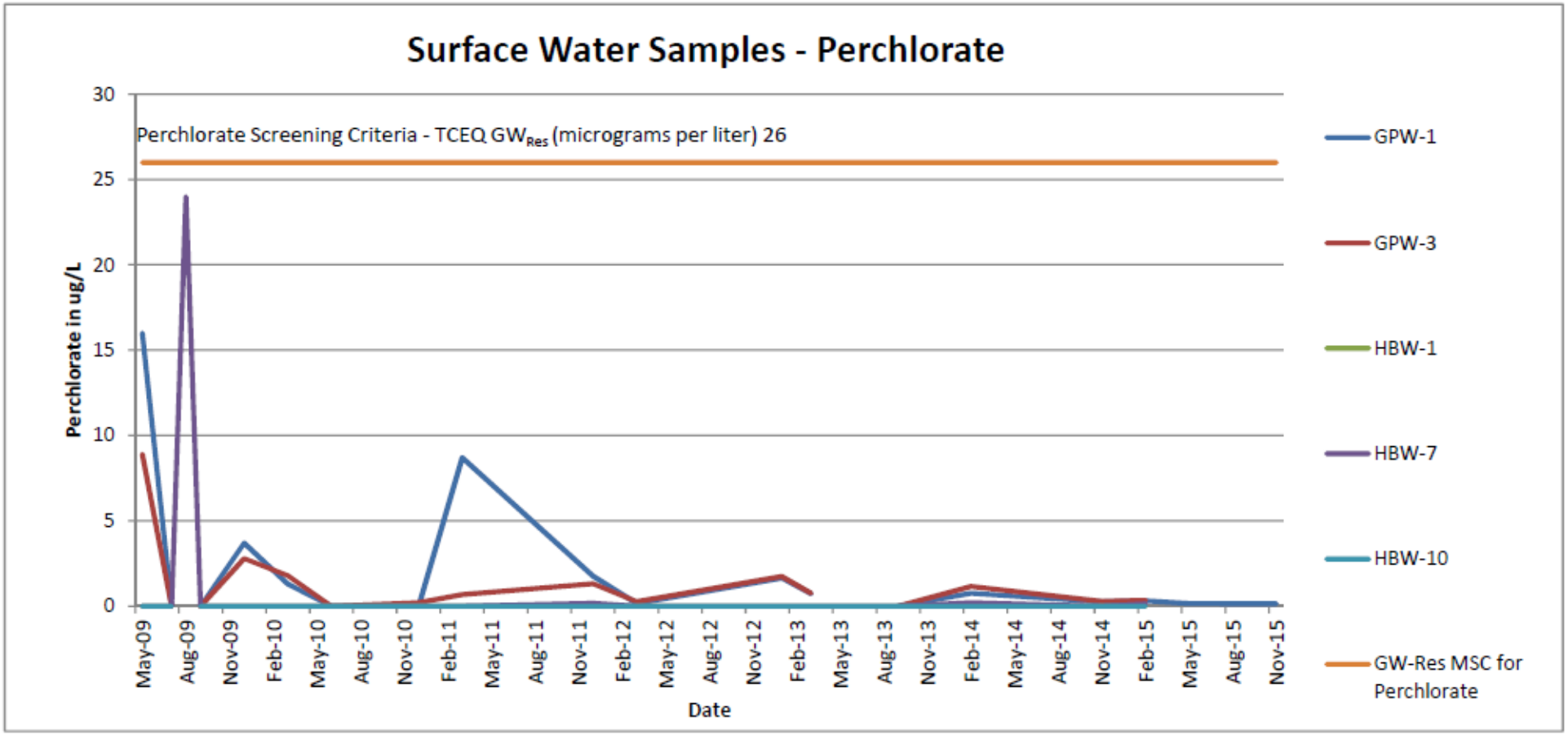
- The Groundwater Treatment Plant continues to operate to contain the plume at LHAAP-18/24 and LHAAP-16.
- Treated groundwater is returned to LHAAP-18/24 through the sprinkler array or to Harrison Bayou.
- LHAAP-18/24 Compliance monitoring of groundwater continues per existing sampling plan.
- Maintenance and repairs of wells, pumps, tanks, and ancillary equipment is on-going. Repairs to the air stripper blower were recently completed.

GWTP O&M (cont)



AECOM

Surface Water Sample Results



GPW – Goose Prairie Creek
HBW – Harrison Bayou

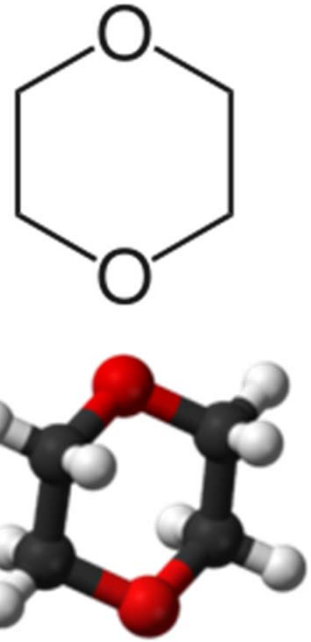
AECOM

LHAAP-47 Soil Cover Repairs

- Repairs were completed 12/9/15

1,4-Dioxane Update

- 77 samples were collected from LHAAP-18/24 to evaluate extent of impacts.
- Sampling completed at LHAAP-18/24 during November/December 2015.
- 51 additional samples were collected other LHAAP sites including LHAAP-03, 12, 16, 17, 29, 37, 46, 50,58 and 67 to evaluate presence of 1,4-dioxane
- This sampling was completed in December 2015

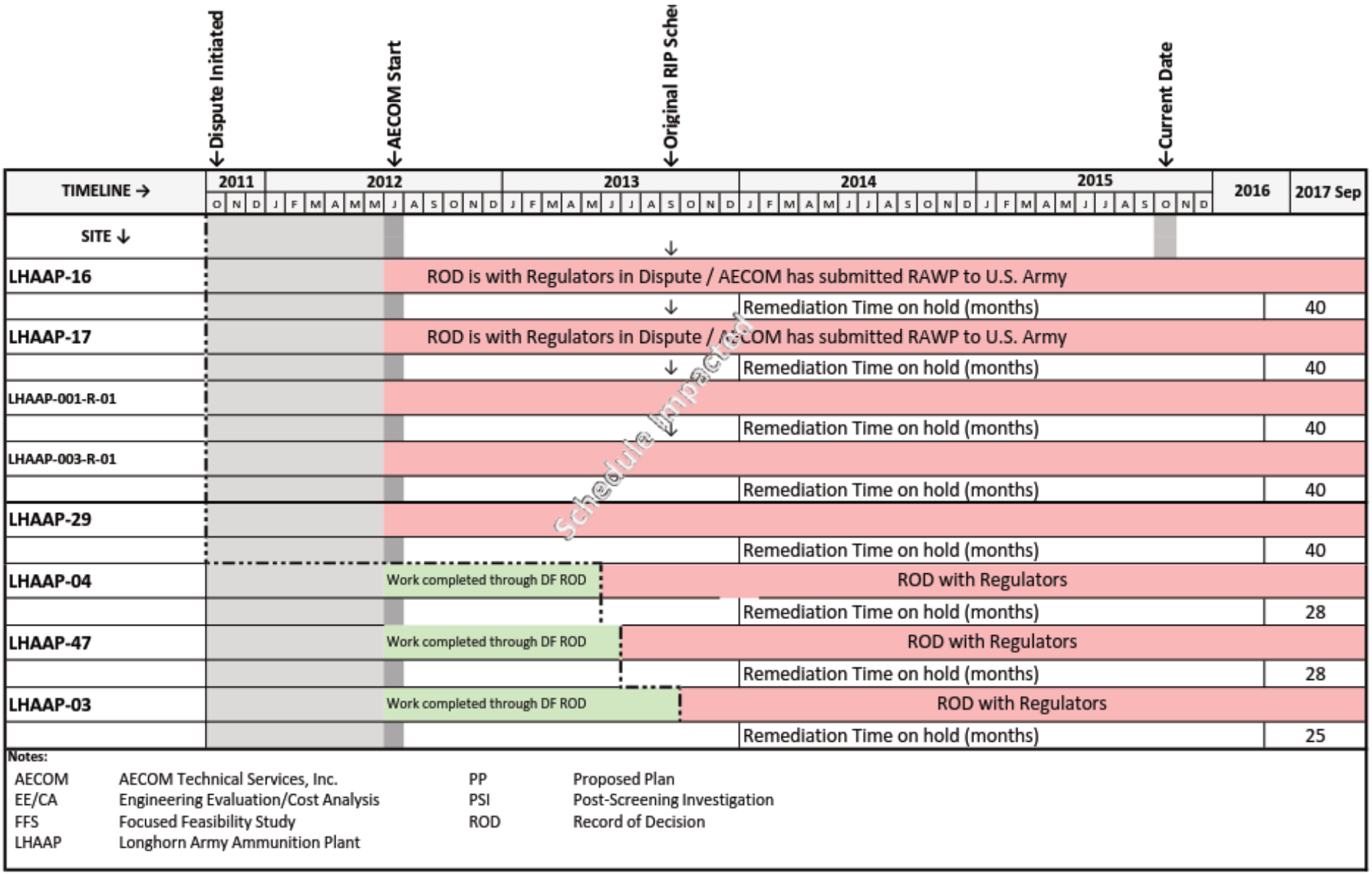


CRP/CIP Questionnaire

- Questionnaires sent out by mail in late October 2015 to over 1,500 addresses in the Karnack/Uncertain zip code
- 71 responses received with several common themes:
    - Generally not aware of RAB/RAB meetings
    - Posting RAB notices in more public places in the community
    - Use of additional media (e.g., Radio) to provide broader notifications
- Army is currently reviewing responses to determine if changes need to be made to the CRP/CIP based on feed back received.

Dispute Status

Sites at which Work has Ceased Pending Resolution of the Dispute



Notes:

AECOM	AECOM Technical Services, Inc.	PP	Proposed Plan
EE/CA	Engineering Evaluation/Cost Analysis	PSI	Post-Screening Investigation
FFS	Focused Feasibility Study	ROD	Record of Decision
LHAAP	Longhorn Army Ammunition Plant		

Upcoming Fieldwork, Meetings, and Documents

Fieldwork

1. Data Gap Investigation at LHAAP-18/24
2. Continue RA-O sampling of groundwater monitoring networks at LHAAP-46, 50, 58, 67
3. Continue semi-annual compliance sampling for LHAAP-18/24
4. Continue geochemistry rebound monitoring at site LHAAP-37

Meetings

1. Continue Monthly Mangers Meetings
2. Continue Quarterly RAB Meetings

Documents

1. Finalize Completion Reports for sites LHAAP-37, 67, and 50
2. Finalize First Annual Remedial Action-Operation Reports for LHAAP-58
3. LHAAP-18/24 – 1,4-Dioxane Memo
4. LHAAP-29 –Draft RI Addendum
5. GWTP Quarterly Operation Reports

Questions?

Groundwater Treatment Plant - Treated Groundwater Volumes

The amount of groundwater treated is determined by measuring the number of gallons of treated water returned to LHAAP-18/24, released to the INF Pond, or discharged to Harrison Bayou.

Treated Water 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

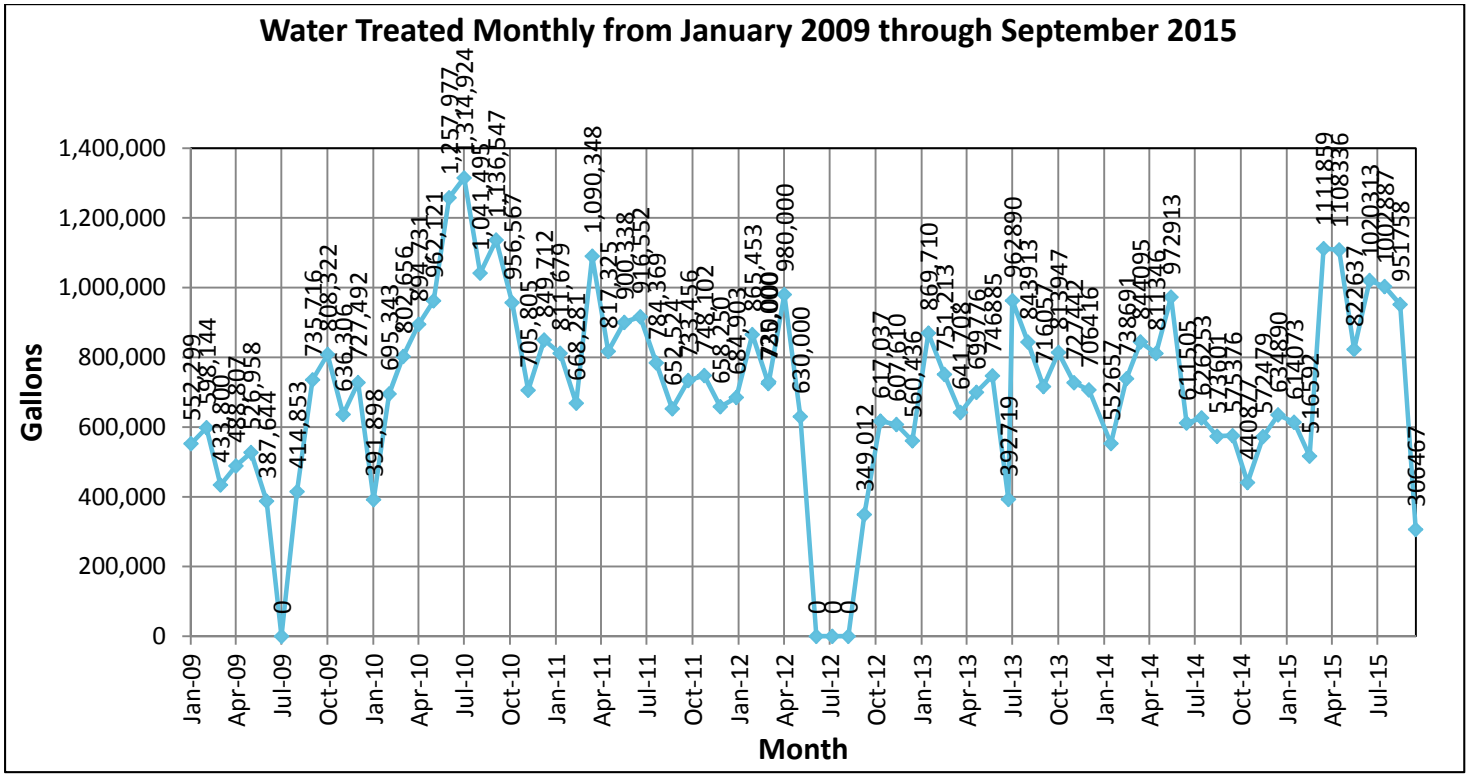
Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
748,102	658,250	684,903	865,453	725,000*	730,000*	980,000*	630,000*	0	0	0	349,012

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-18	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

*Indicates Estimate

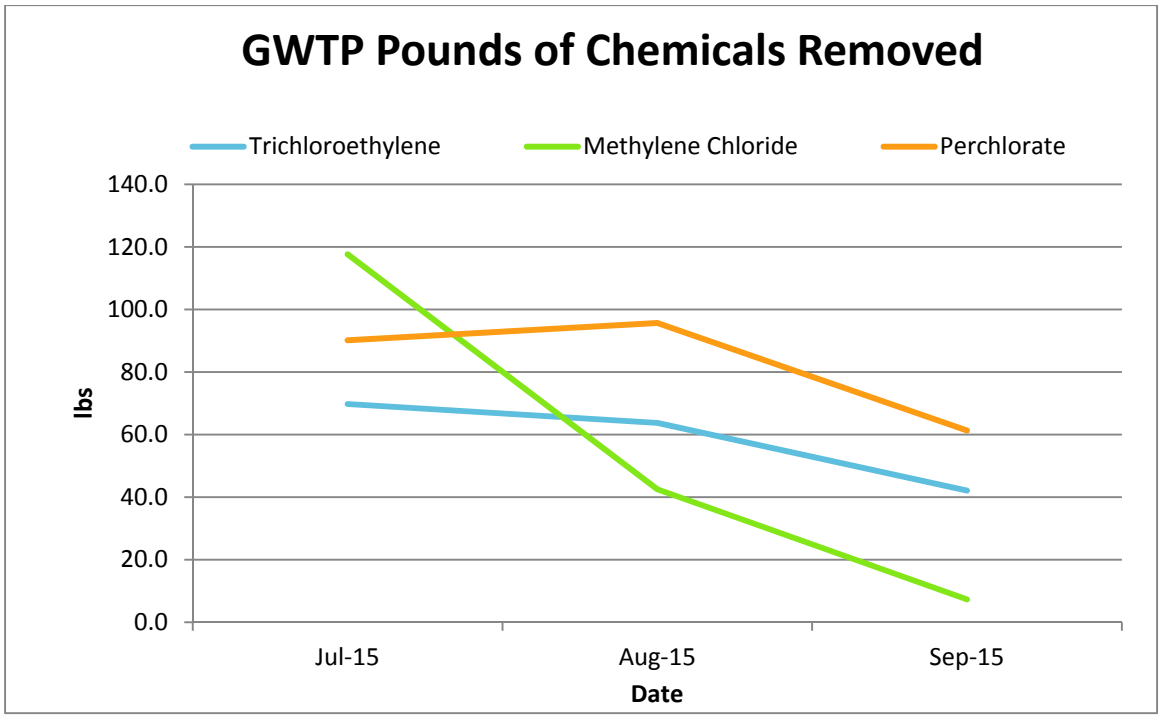


The pounds of chemicals removed for the 3rd Quarter of 2015 can be found below and are calculated by the following formula:

$$\frac{\text{(GWTP Influent Contaminant Concentration [µg/L] x Volume [gallons] x 3.785 [liters per gallon])}}{\text{(453,600,000 µg per pound)}}$$

Pounds of Chemicals Removed From LHAAP-18/24, 3rd Quarter 2015

	Trichloroethylene	Methylene Chloride	Perchlorate
Jul-15	69.8	118	90.2
Aug-15	63.7	42.5	95.7
Sep-15	42.1	7.32	61.3



Water Discharge Location and Volume (Gallons)

Month	Harrison Bayou	LHAAP-18/24 Sprinklers	INF Pond
Jul-15	0	874,260	0
Aug-15	0	770,420	0
Sep-15	0	310,630	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.

Historic 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	<1.0U	-	4	<4.0 U	<4.0 U	<4.0 U	-	2.65	<4.0 U	<4.0 U	<4.0 U
GPW-3	<1.0U	<4.0 U	17	8	<4.0 U	<4.0 U	-	2.28	<4.0 U	<4.0 U	<4.0 U
HBW-1	-	<80.0 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	-	-

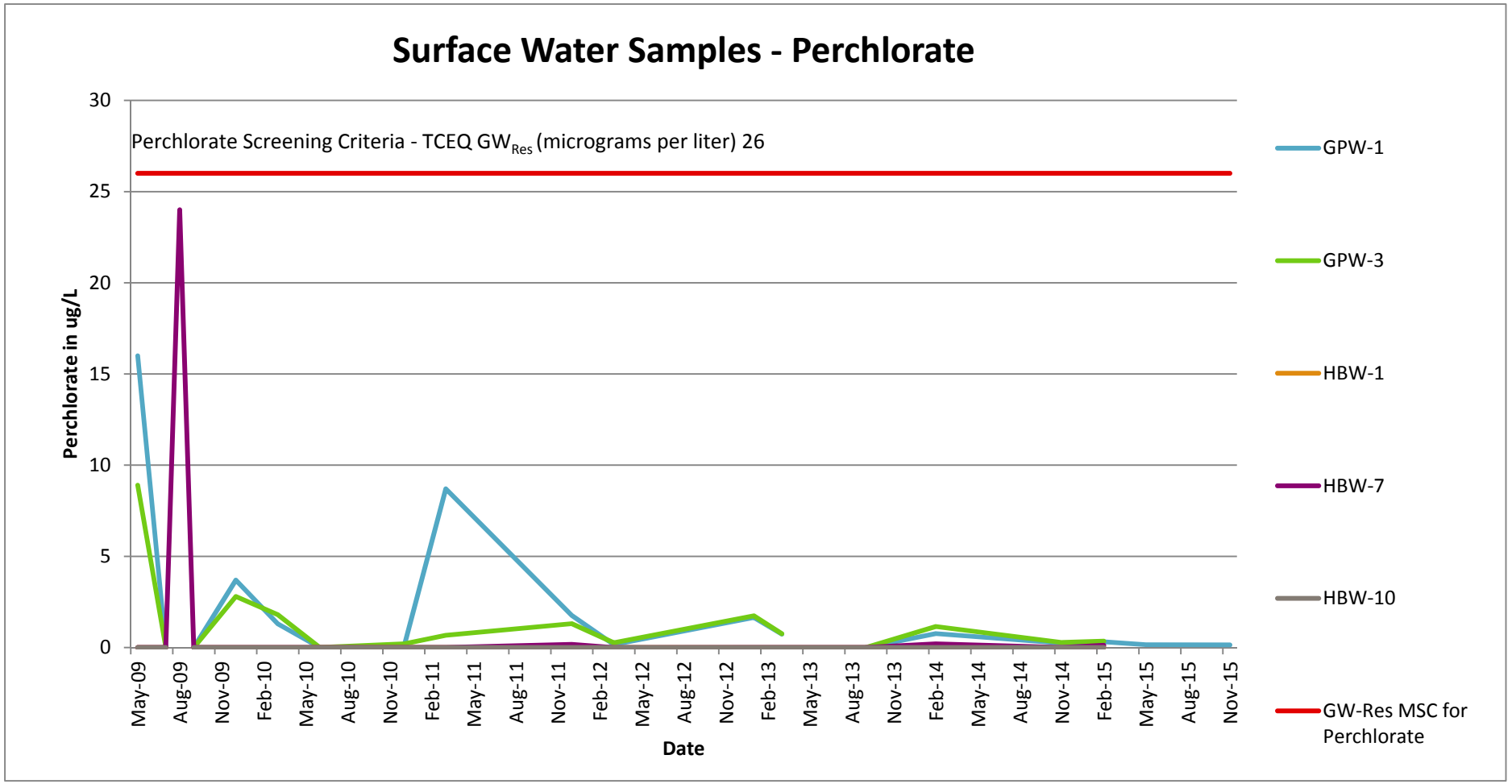
Quarter	2nd	3rd	4th	1st	2nd	3rd	3rd	4th	2nd	3rd	4th
Creek Sample ID	**June 2002**	**Sept 2002**	**Dec 2002**	**Feb 2003**	**June 2003**	**Aug 2003**	**July 2004**	**Dec 2006**	**May 2007**	**Aug 2007**	**Dec 2007**
GPW-1	<4.0 U	<4.0 U	18.3	18.6	59.9	-	2.25	-	<1.0 U	<1.0 U	10.7
GPW-3	<4.0 U	<4.0 U	5.49	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	<0.2U	<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	<0.2U	<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	-	<0.2U	<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	<0.5U	<0.5U	<0.22U	16	<4U	NS	<1.2U	3.7	1.3J	<0.6U
GPW-3	21.9	9.42	1.1	<0.22U	8.9	<4U	NS	<0.6U	2.8	1.8J	<0.6U
HBW-1	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.5U	<0.6U
HBW-7	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	24	<1.2U	<0.275U	1.5U	<0.6U
HBW-10	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.2U	<0.6U

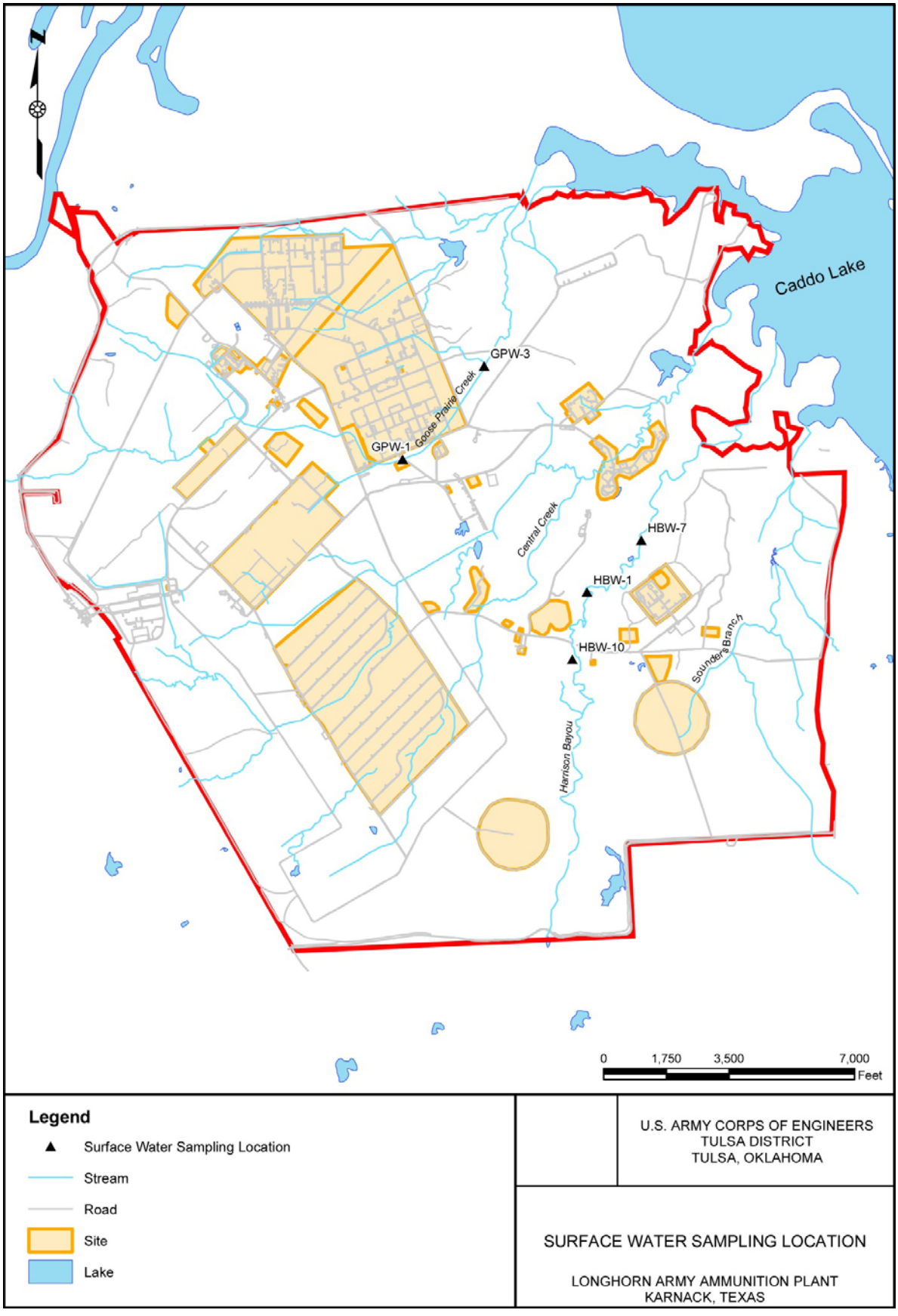
Quarter	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Creek Sample ID	**Sep 2010**	**Dec 2010**	**Mar 2011**	**Jun 2011**	**Sep 2011**	**Dec 2011**	**Mar 2012**	**Jun 2012**	**Not Applicable**	**Jan & Feb 2013**	**Mar 2013**
GPW-1	dry	<0.1U	8.7	dry	dry	1.76	0.163J	dry	NS	1.65	0.735
GPW-3	dry	0.199J	0.673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

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	0.156J	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	<0.2U	<0.2 U	dry	<0.2 U	dry	dry	<0.2 U	<0.2 U	dry	dry	<0.2 U
HBW-7	<0.2U	<0.2 U	dry	0.201 J	dry	dry	<0.2 U	0.124 J	dry	dry	<0.2 U
HBW-10	<0.2U	<0.2 U	dry	<0.2 U	dry	dry	<0.2 U	<0.2 U	dry	dry	<0.2 U

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


Surface Water Samples - Perchlorate
Perchlorate Screening Criteria - TCEQ GWRes (micrograms per liter) 26
Perchlorate in ug/L
30
25
20
15
10
5
0
May-09
Aug-09
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Feb-11
May-11
Aug-11
Nov-11
Feb-12
May-12
Aug-12
Nov-12
Feb-13
May-13
Aug-13
Nov-13
Feb-14
May-14
Aug-14
Nov-14
Feb-15
May-15
Aug-15
Nov-15
Date
GPW-1
GPW-3
HBW-1
HBW-7
HBW-10
GW-Res MSC for Perchlorate

Longhorn Army Ammuntion Plant Creek Sampling Locations



LHAAP Perimeter Well Monitoring – Perchlorate Data

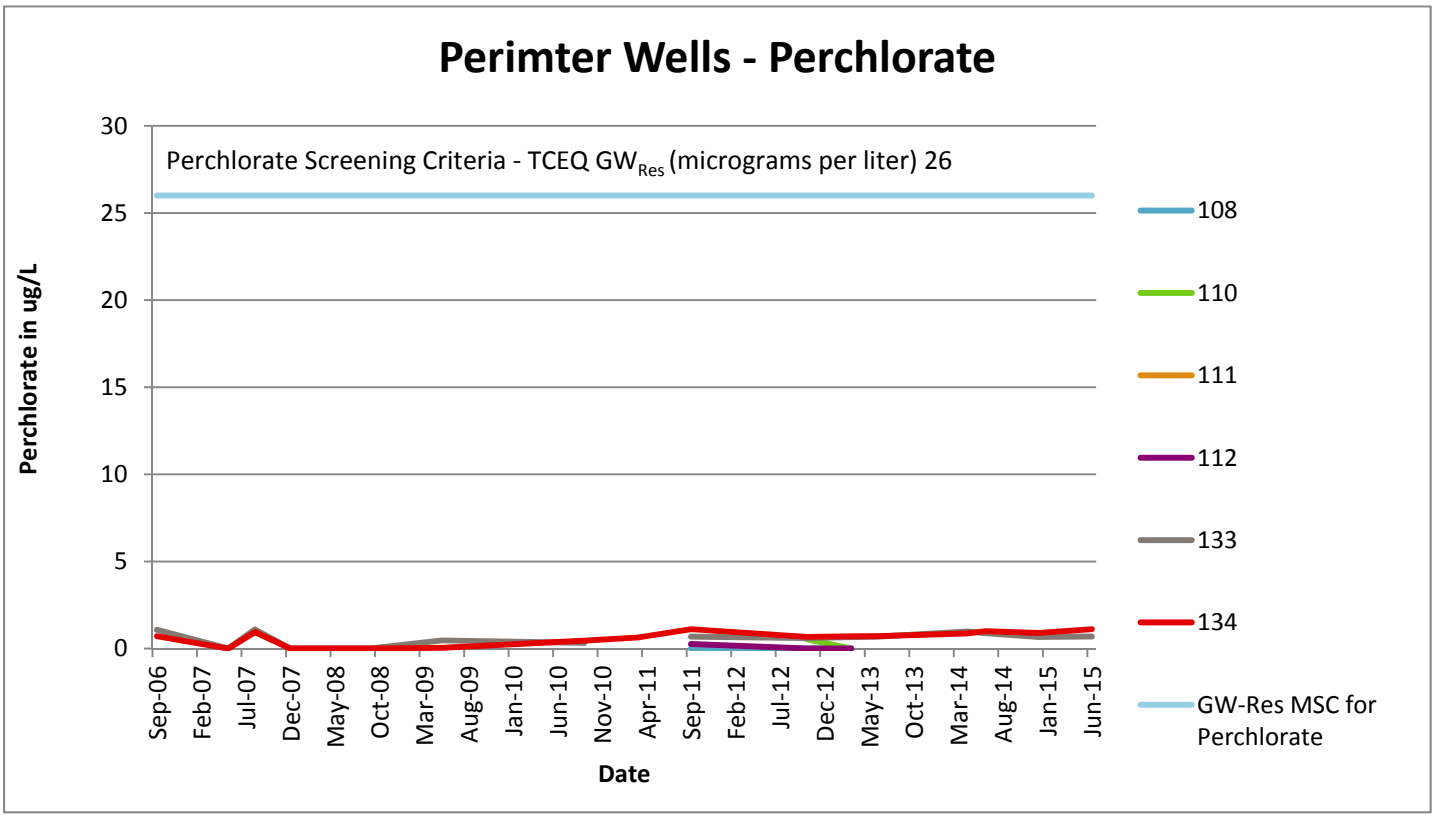
Groundwater samples are currently collected annually from four wells and semi-annually from two wells on the LHAAP perimeter.

Historic Perimeter Well Sample Data
(in micrograms per liter)

Well ID	Jun 2005	Sep 2005	Sep 2006	May 2007	Aug 2007	Dec 2007	Mar 2008	Sep 2008	May 2009	Sep 2009	Mar 2010
108	NS	NS	10 U	NS	0.5 U	NS	NS	2.5 U	NS	1.2 U	NS
110	NS	NS	10 U	NS	10 U	NS	NS	5.0 U	NS	6 U	NS
111	NS	NS	4 U	NS	0.5 U	NS	NS	0.5 U	NS	0.3 U	NS
112	NS	NS	5 U	NS	3 U	NS	NS	2.0 U	NS	3 U	NS
133	0.541	0.597	1.08	1 U	1.09	0.5 U	0.5 U	0.5 U	0.47 J	0.32	Dry
134	0.881	0.725	0.708 J	1 U	0.949 J	0.5 U	0.5 U	0.829 U	0.04 J	0.3 U	0.3 U

Well ID	Sep 2010	Mar 2011	Sep 2011	Oct 2012	Mar 2013	Jun 2013	Apr 2014	Jun 2014	Dec 2014	Jun 2015
108	3 U	NS	0.1 U	0.2 U	0.2 U	NS	NS	0.2 U	NS	0.566
110	Dry	NS	Dry	0.535	0.2 U	NS	NS	0.2 U	NS	2U
111	Dry	NS	Dry	Dry	1.32	NS	NS	Dry	NS	0.2U
112	3 U	NS	0.26	0.2 U	0.2 U	NS	NS	0.458	NS	2U
133	0.32	Dry	0.68	0.598	0.655	0.685	0.988	0.887	0.665	0.692
134	0.45	0.636	1.11	0.671	0.698	0.706	0.863	0.989	0.890	1.11

Notes:
J – Estimated U – Non-Detect Dry – Well Dry NS – Not Sampled



Longhorn Army Ammuntion Plant Map with Perimeter Well Locations