



LONGHORN ARMY AMMUNITION PLANT
RESTORATION ADVISORY BOARD

Karnack, Texas
(479) 635-0110

AGENDA

DATE: Thursday, April 19, 2018
TIME: 4:00 – 5:00 PM
PLACE: Karnack Community Center, Karnack, Texas

04:00 **Welcome and Introduction**

04:05 **Open Items {RMZ}**

- RAB Administrative Issues
- Minutes (January 2018 RAB Meeting)
- Ongoing Outreach/Website

04:15 **Defense Environmental Restoration Program (DERP) Update {Bhate}**

- Documents and Field Work Completed in 1st Quarter 2018
- Three Month Lookahead
- LHAAP-58 Contingent Remedy Implementation
- LHAAP-16 Remedial Action
- Groundwater Treatment Plant (GWTP) Update
- Overview of Tour that will follow the RAB

04:45 **Environmental Restoration Issues {RMZ}**

- Update on LHAAP Sites -18/24, -29 and -47

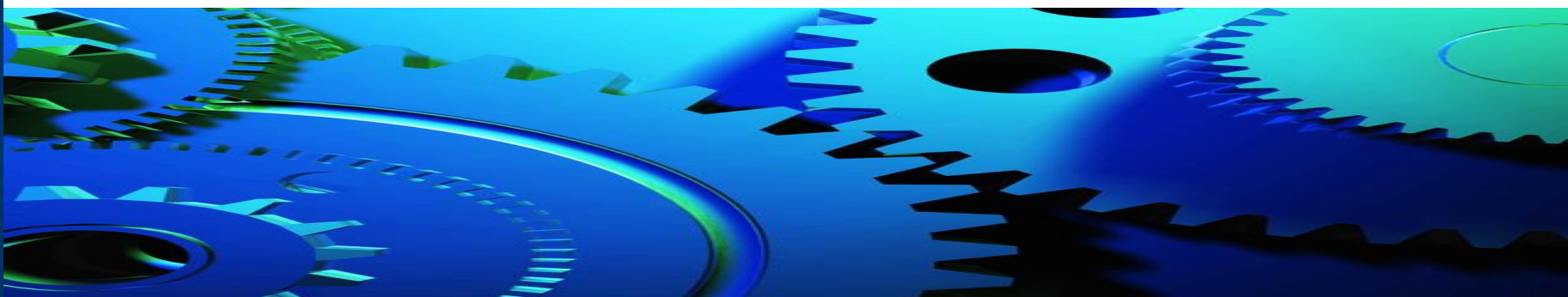
04:50 **Next RAB Meeting Schedule and Closing Remarks {RMZ}**

05:00 **Tour of LHAAP (Participants to drive their own vehicles or carpool)**



**Longhorn Army
Ammunition Plant
Quarterly Restoration Advisory
Board Meeting**

**Karnack Community Center
April 19, 2018
4:00 PM CDT**



Restoration Advisory Board (RAB) Meeting

Agenda

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Restoration Advisory Board Meeting

Abbreviations and Acronyms

µg/L	micrograms per liter
DERP	Defense Environmental Restoration Program
DF	Draft Final
EISB	Enhanced in-situ bioremediation
ERD	Enhanced reductive dechlorination
ESD	Explanation of Significant Difference
EW	extraction well
ft bgs	feet below ground surface
GWTP	groundwater treatment plant
ISB	In-situ bioremediation
IW	injection well
LHAAP	Longhorn Army Ammunition Plant
MNA	monitored natural attenuation
MW	monitoring well

RAB	Restoration Advisory Board
RA-O	Remedial Action - Operation
RACR	Remedial Action Completion Report
RAWP	Remedial Action Work Plan
RD	Remedial Design
ROD	Record of Decision
RTC	response to comment

Restoration Advisory Board Meeting

RAB Administrative Issues

RAB Membership

RAB Tour

Restoration Advisory Board Meeting

Minutes from Past RAB Meetings

Discussion of January 2018 RAB Meeting minutes/motion to accept

The Army Wants You to be Informed

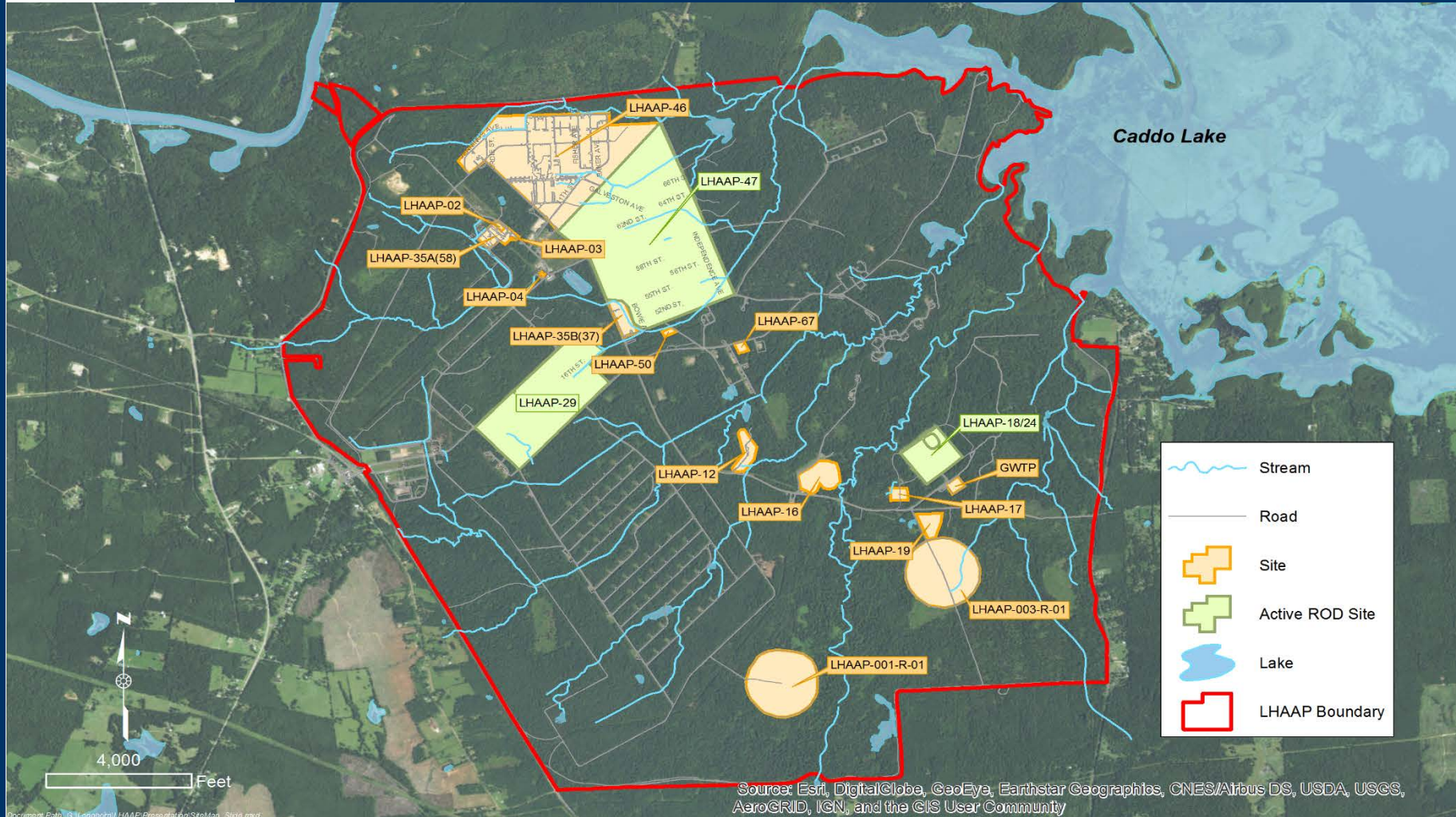
- The Army is committed to protecting human health and the environment; key to that commitment is engaging the community and increasing public participation in environmental restoration at LHAAP
- You are encouraged to:
 - Attend RAB Meetings and/or become a member of the RAB
 - Visit the Longhorn environmental website at www.longhornaap.com
 - Make suggestions for improving communication – the Army welcomes and appreciates community feedback

Outreach

- Website Address: <http://www.longhornaap.com/>
- Website will be updated to indicate the upcoming field events at each site including groundwater sampling, monitoring well installations, soil sampling, or remediation activities

Restoration Advisory Board Meeting

Site Map



Restoration Advisory Board Meeting

Documents in Process

Site	Document
Basewide	Installation Wide Work Plan
LHAAP-03	Response to Comment (RTC) – Draft Final (DF) Record of Decision (ROD)
LHAAP-03/58	Explanation of Significant Difference (ESD) to address groundwater under LHAAP-03
LHAAP-12	Annual Remedial Action – Operation (RA-O) Report
LHAAP-16	Remedial Action Work Plan (RAWP)
LHAAP-17	Pre-Design Investigation (PDI) Report
LHAAP-50	Year 3 RA-O Report
LHAAP-58	ESD, Year 3 RA-O Report
GWTP, LHAAP-18/24 and Surface Water	Quarterly Evaluation Report Fourth Quarter (October – December) 2017

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Completed Field Work

Site	Activity
LHAAP-04	Installed new wells (Dec 2017) and sampled all wells (Jan 2018)
LHAAP-12	RA-O Sampling – December 2017
LHAAP-16	Compliance groundwater sampling – February 2018
LHAAP-17	PDI – Sampled Existing Groundwater Wells (Nov 2017), installed shallow well (Dec 2017) and piezometers, initiated soil sampling (Jan 2018)
LHAAP-19	Repairs to landfill cap
LHAAP-37	RA-O Sampling – February 2018
LHAAP-46	RA-O Sampling – February 2018
LHAAP-58	Baseline Groundwater Sampling and Enhanced Reductive Dechlorination (ERD) Injections
LHAAP-67	RA-O Sampling – December 2017
Surface Water	Surface Water Sampling – March 2018

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3 Month Look Ahead - Documents

Site	Document
LHAAP-03	RTC – DF ROD
LHAAP-03/58	ESD
LHAAP-12	Annual RA-O Report for 2017 (Year 3)
LHAAP-16	RAWP
LHAAP-17	PDI Report
LHAAP-50	Year 3 RA-O Report
LHAAP-58	Remedial Action Completion Report (RACR)
GWTP, LHAAP-18/24, LHAAP-16, Surface Water	Quarterly Evaluation Reports: Fourth Quarter (October –December) 2017 and First Quarter (January – March) 2018

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3 Month Look Ahead - Field Work

Site	Activity
LHAAP-02	Groundwater Sampling - April 2018
LHAAP-16	Monitoring well and injection well installation, pre-remedy groundwater sampling, in-situ bioremediation (ISB) injections – April to June 2018
LHAAP-17	PDI – If site conditions dry up - complete soil sampling; install additional shallow well and complete additional groundwater sampling
LHAAP-18/24	RA-O Sampling
LHAAP-37	RA-O Sampling – May 2018
LHAAP-50	RA-O Sampling – May 2018
LHAAP-58	RA-O Sampling
LHAAP-67	RA-O Sampling – May 2018
Surface Water	Collect Surface Water samples

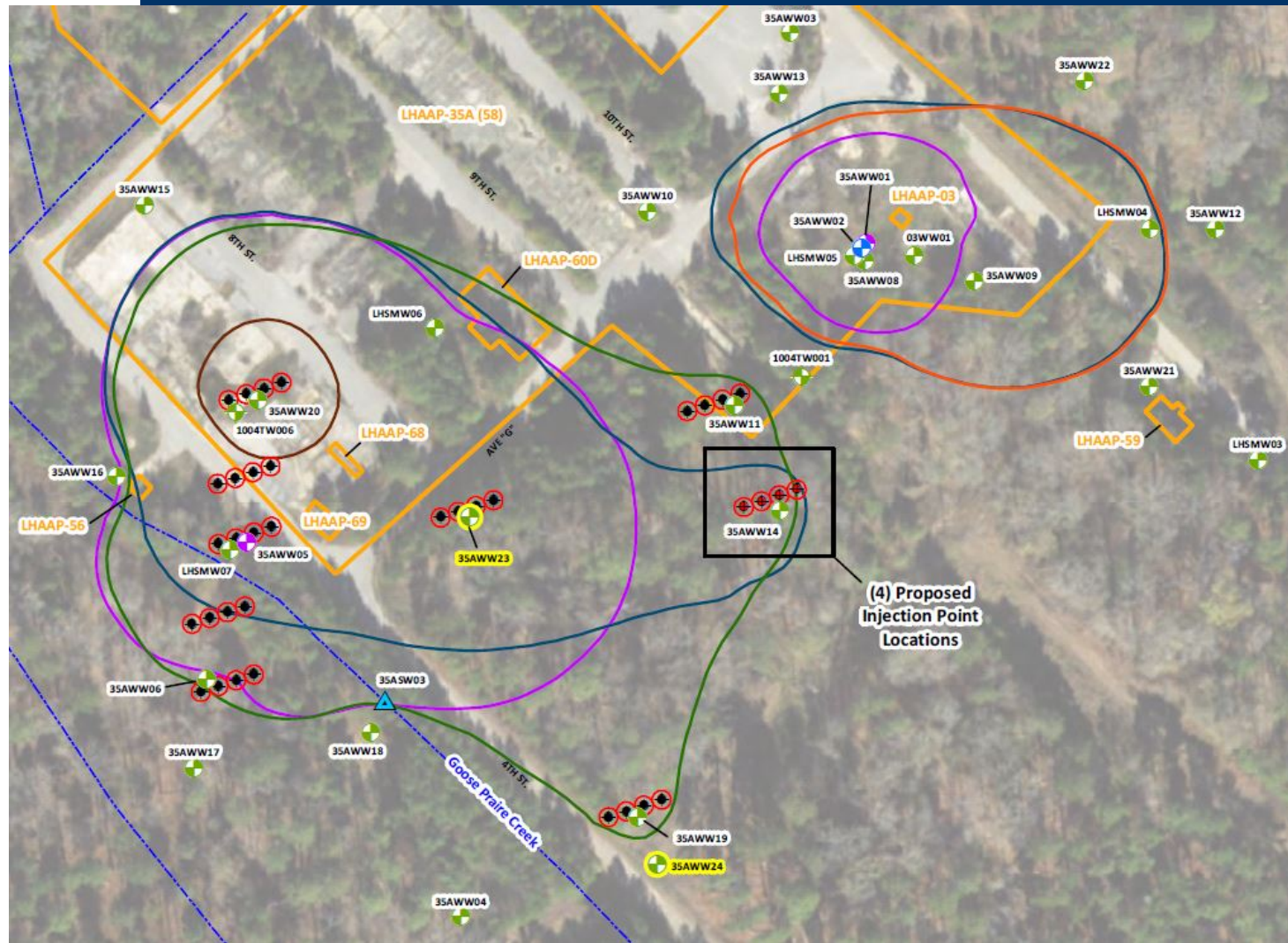
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LHAAP-58: Shops Area, Group 3

- **Shallow zone groundwater is impacted with volatile organic compounds (VOCs)**
 - **Groundwater plume has two distinct areas: eastern plume and western plume**
- **Soil poses no unacceptable threat to human health or the environment**
- **2018 Contingency Remedy Implemented – Western Plume**
 - **Monitored natural attenuation (MNA) remedy for the western plume, as presented in the ROD, calls for an evaluation of the remedy after 2 years**
 - **ROD provides for implementation of a contingency remedy to enhance MNA if MNA is found to be ineffective**
 - **RA-O implementation was completed between October 2013 and October 2015 and the 2nd year RA-O report was finalized in May 2016**
 - **After 2 years of MNA, the 2nd year RA-O report concluded that MNA is ineffective and implementation of a contingency remedy is appropriate**
 - **Contingency Remedy is enhanced in-situ bioremediation (EISB) for the western plume**

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LHAAP-58: Contingent Remedial Action



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LHAAP-58: Contingent Remedial Action



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LHAAP-58: Current Status

- Completed Contingent Remedy
 - Emulsified Vegetable Oil
 - Bacteria added for bioaugmentation
- Semi-Annual RA-O sampling planned for June 2018

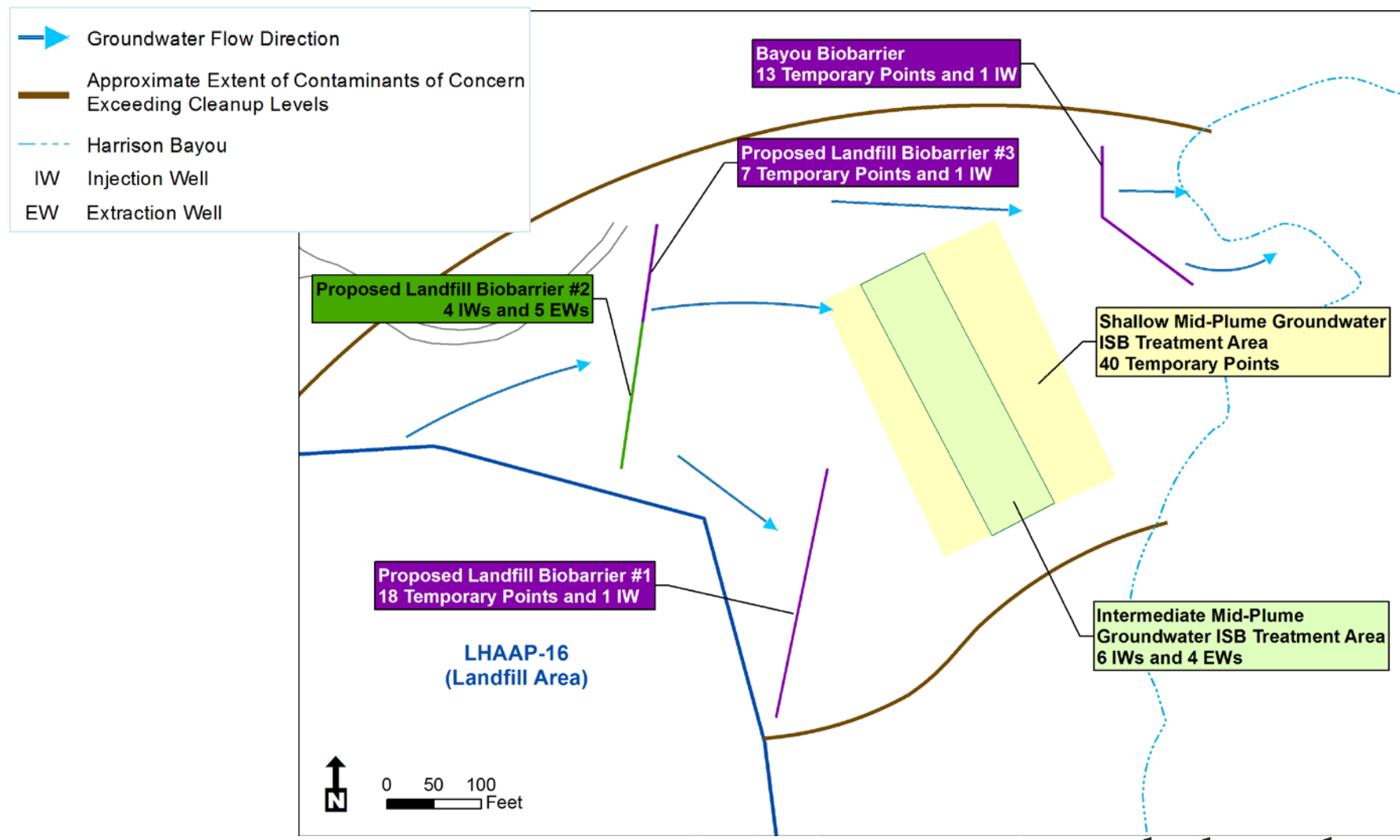
Restoration Advisory Board Meeting

LHAAP-16: Remedial Action

- **Site conditions**
 - LHAAP-16 is a capped landfill approximately 20 acres
 - Groundwater plumes are present in shallow zone (4 feet below ground surface [ft bgs] near Harrison Bayou to 25 ft bgs near landfill) and intermediate zone (35 to 62 ft bgs)
 - Contaminants include chlorinated volatile organic compounds, perchlorate, and metals
 - Groundwater flow is towards Harrison Bayou
- **Status**
 - Remedial Design (RD) approved in January 2017 for ISB
 - RAWP is in comment resolution phase with the regulators
 - Installation of additional monitoring wells and injection wells – April - May 2018
 - Begin injections – May/June 2018
- **ISB**
 - ISB injections and phased shutdown of existing extraction system
 - Performance monitoring will be conducted for 2 years post injections
 - The ISB is focused on areas of the highest concentrations and is expected to reduce concentrations to allow the remaining plume areas to naturally attenuate after injections
 - After performance monitoring, it will be determined if MNA is a viable remedy for the remaining plume

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LHAAP-16 Remedial Action



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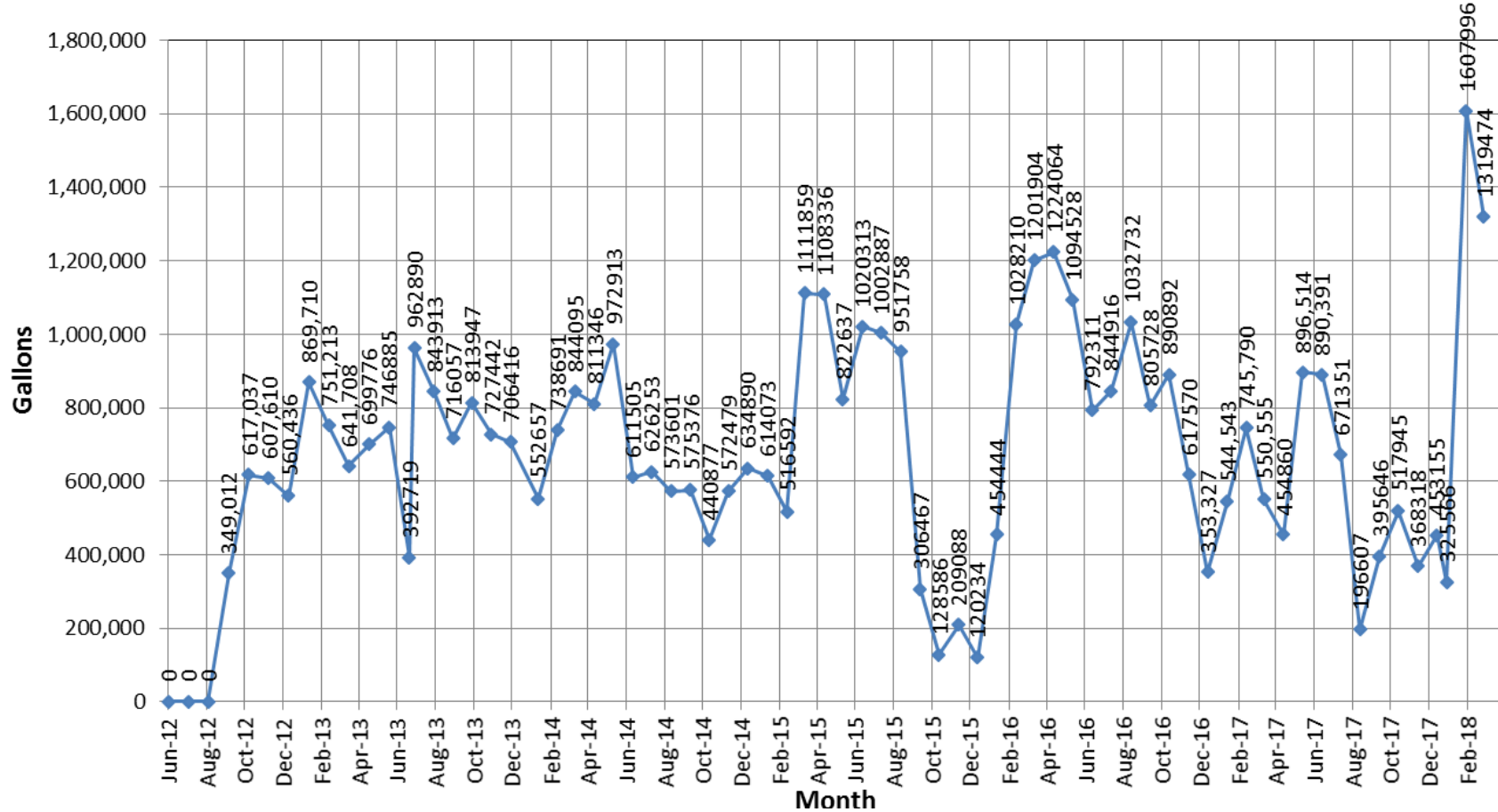
LHAAP-16: ISB Remedial Action

- ISB (Contd)
 - Injection of carbon sources (emulsified vegetable oil) and bacteria for bioremediation to enhance aquifer conditions for reductive dechlorination to reduce volatile organic and perchlorate concentrations
 - Injection mixture will consist of water, emulsified vegetable oil, bacteria, nutrients, and a tracer
 - Additionally, iron will be added to the injection mixture at the Bayou Biobarrier
 - Some locations use temporary injection points that use direct push technology
 - Other locations use injection wells (existing or new) and extraction wells (existing)
 - Where there are extraction wells, the extraction system will be used to help distribute the injected material by using the tracer. Once distributed, the extraction will be turned off and the extraction wells will be used for injections.

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GWTP Update

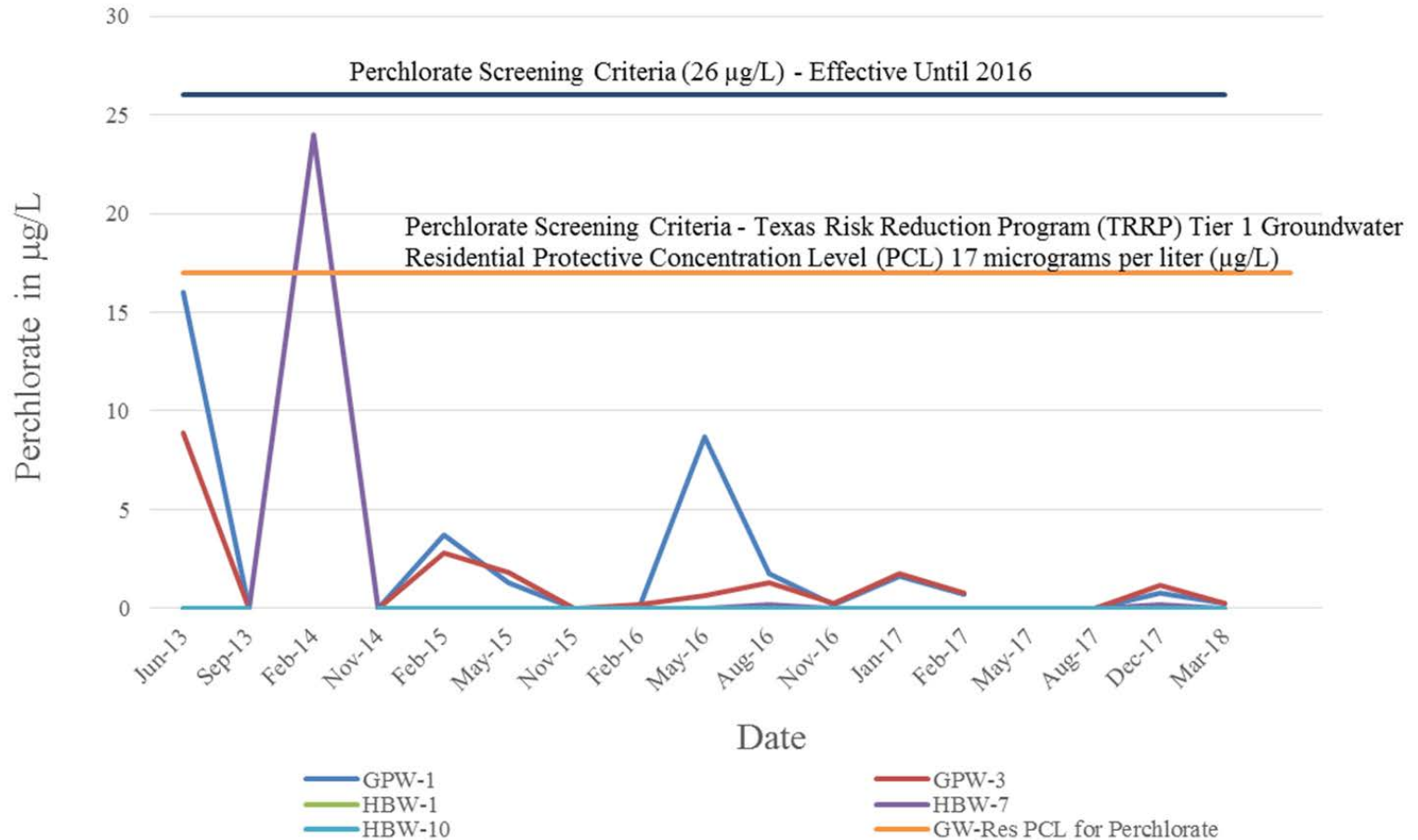
Water Treated and Discharge Monthly from June 2012 through March 2018



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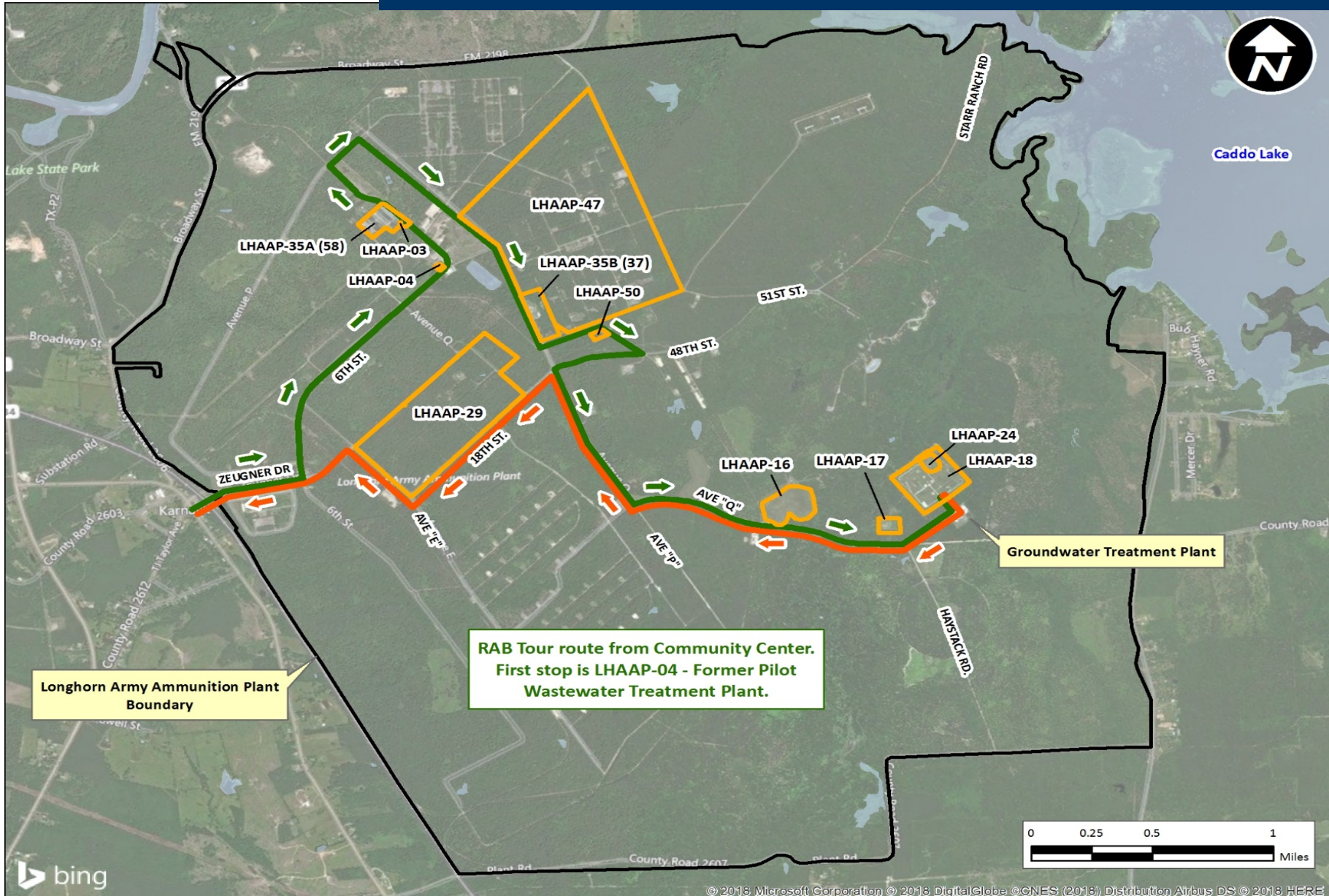
Surface Water Sample Results

Surface Water Samples - Perchlorate



Restoration Advisory Board Meeting

RAB Site Tour



Next RAB Meeting Schedule & Closing Remarks

- Schedule July 2018 RAB Meeting
- Other Issues/Remarks
- LHAAP Tour

Groundwater Treatment Plant - Processed Groundwater Volumes

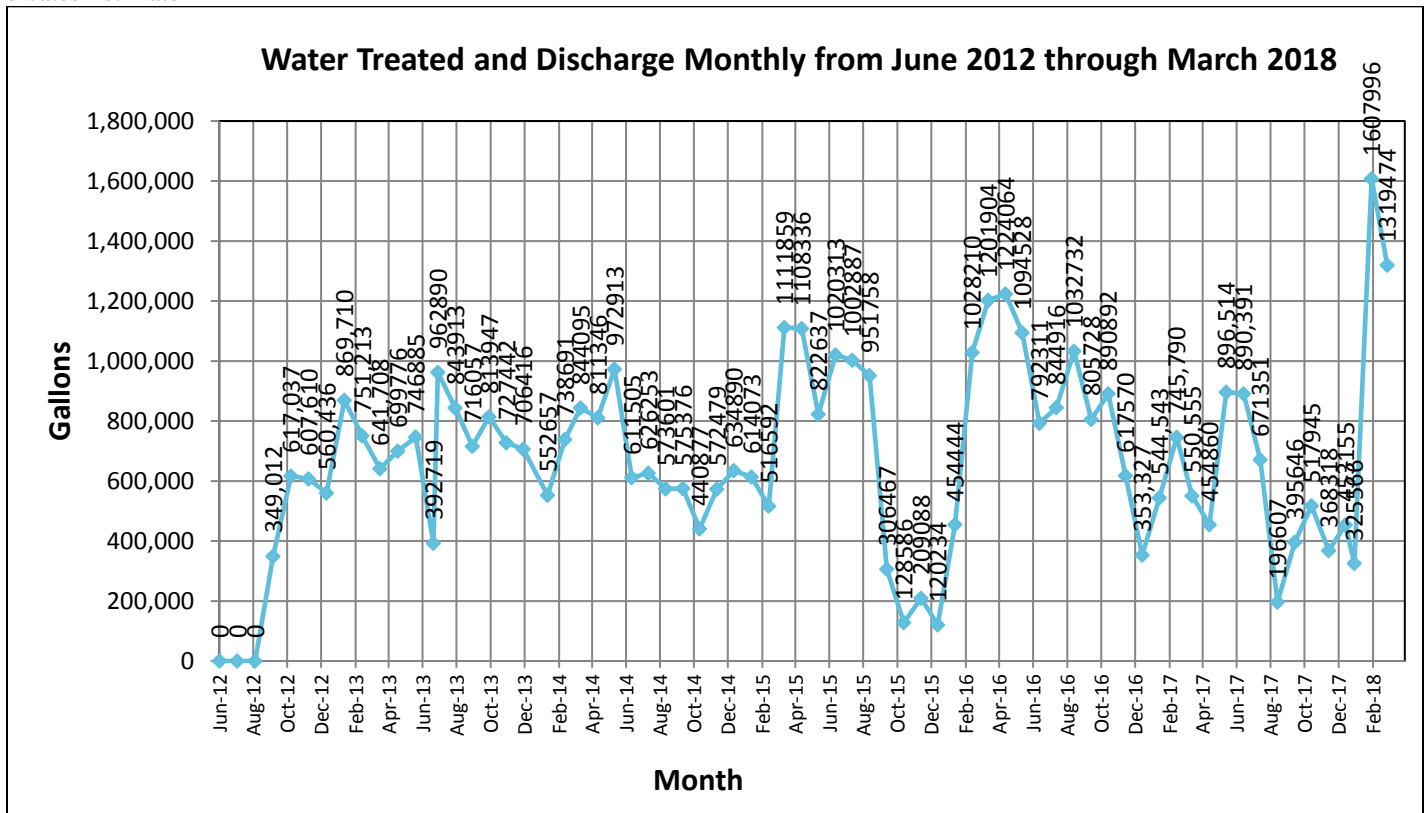
The amount of groundwater treated is determined by measuring the number of gallons of processed water.

Processed 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-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						
517,945	368,318	453,155	325,566	1,607,996	1,319,474						

*Indicates Estimate



Water Discharge Location and Volume (Gallons)

Month	Harrison Bayou	LHAAP-18/24 Sprinklers	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	205,665	0	534,155	0	0
Jun-17	467,830	0	294,550	490,574	0
Jul-17	0	0	528,538	0	0
Aug-17	0	0	195,197	0	0
Sep-17	0	0	309,980	651,434	0
Oct-17	0	0	517,945	0	0
Nov-17	0	0	368,318	0	0
Dec-17	0	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

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

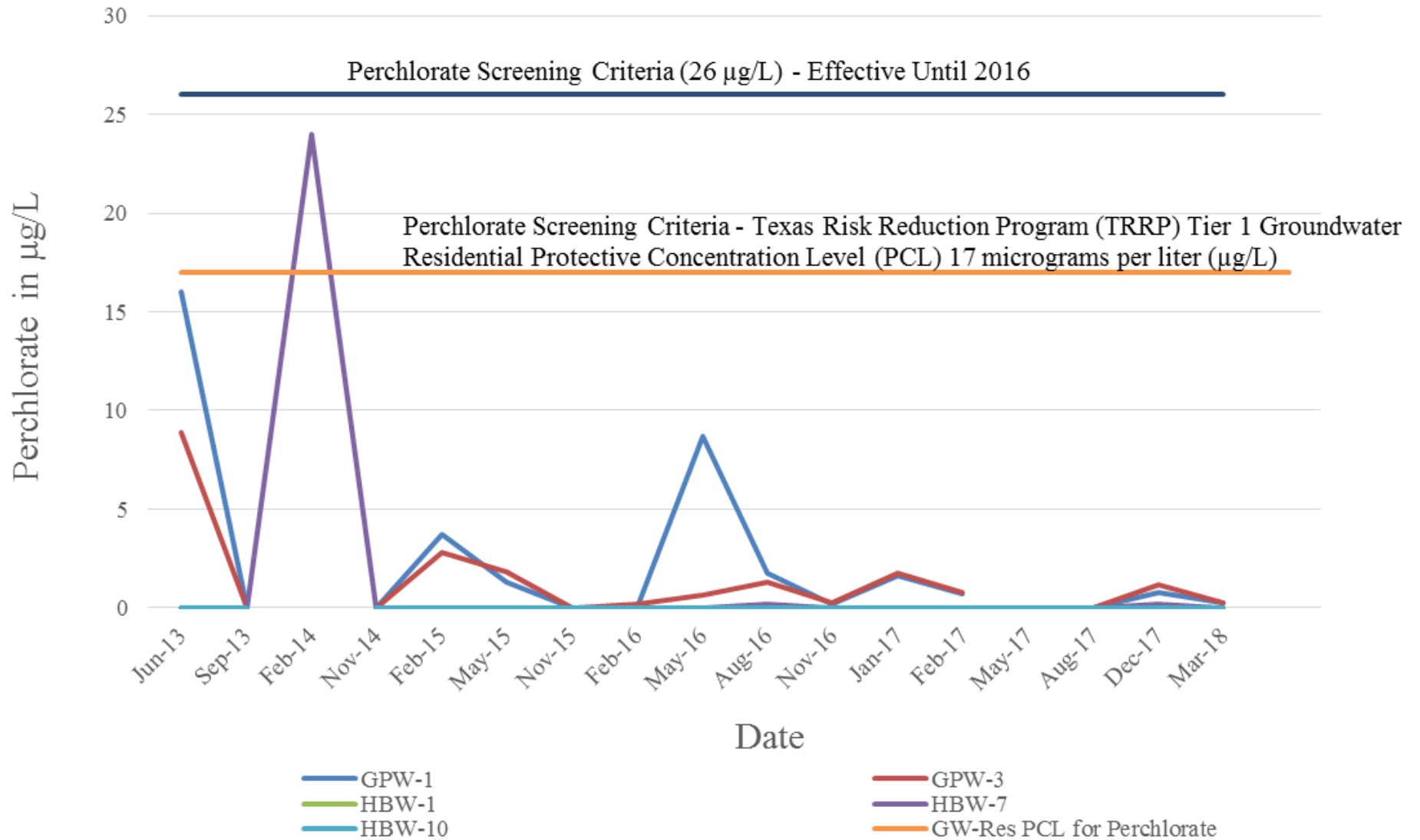
Quarter	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st
Creek Sample ID	Sep 2010	Dec 2010	Mar 2011	Jun 2011	Sep 2011	Dec 2011	Mar 2012	Jun 2012	Not Applicable	Jan & Feb 2013	Mar 2013
GPW-1	dry	<0.1U	8.7	dry	dry	1.76	0.163J	dry	NS	1.65	0.735
GPW-3	dry	0.199J	0.673	dry	dry	1.31	0.261	dry	NS	1.74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

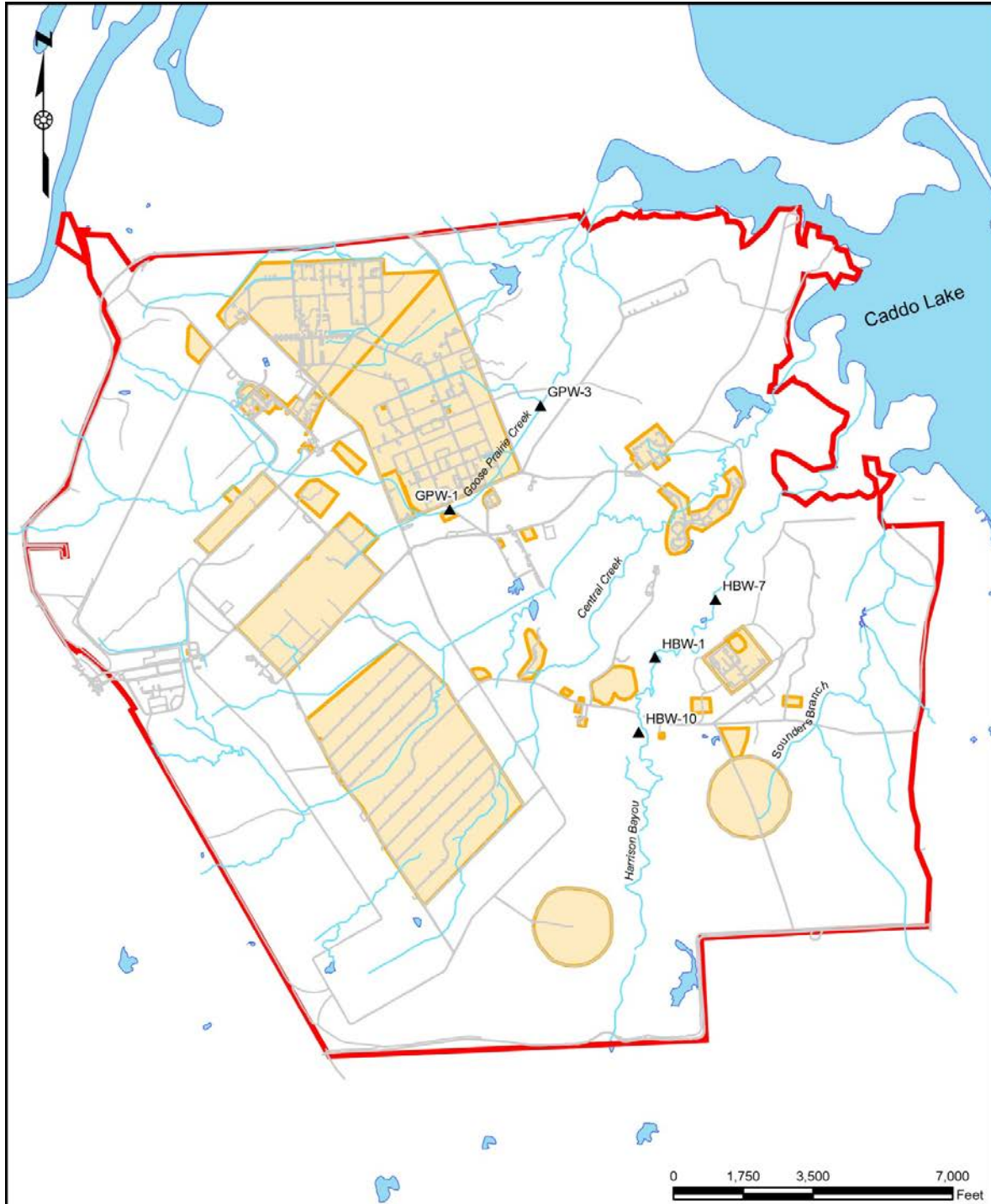
Quarter	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st
Creek Sample ID	Feb 2016	May 2016	Aug 2016	Nov 2016	Feb 2017	May 2017	Aug 2017	Dec 2017	March 2018
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	dry	<4.0 U	<4.0 U
GPW-3	0.474	0.457	0.141	0.563	<1 U	0.274	dry	<4.0 U	<4.0 U
HBW-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	1.1 J	<4.0 U
HBW-7	<0.2 U	<0.2 U	<0.2 U	0.318 J	<1 U	0.155	<0.2 U	<4.0 U	<4.0 U
HBW-10	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	0.111J	<4.0 U	<4.0 U

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

Surface Water Samples - Perchlorate



Longhorn Army Ammunition Plant Creek Sampling Locations



Legend <ul style="list-style-type: none">▲ Surface Water Sampling Location— Stream— Road■ Site■ Lake	U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT TULSA, OKLAHOMA
SURFACE WATER SAMPLING LOCATION LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS	