## AGENDA

<table>
<thead>
<tr>
<th>Time</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>06:00</td>
<td>Welcome and Introduction</td>
</tr>
<tr>
<td>06:05</td>
<td>Open Items (RMZ)</td>
</tr>
<tr>
<td></td>
<td>- RAB Administrative Issues</td>
</tr>
<tr>
<td></td>
<td>- Minutes (January 2017 RAB Meeting)</td>
</tr>
<tr>
<td></td>
<td>- Ongoing Outreach/Website</td>
</tr>
<tr>
<td>06:15</td>
<td>Defense Environmental Restoration Program (DERP) Update (AECOM)</td>
</tr>
<tr>
<td></td>
<td>- LHAAP-04 ROD</td>
</tr>
<tr>
<td></td>
<td>- LHAAP-16 RD</td>
</tr>
<tr>
<td></td>
<td>- Groundwater Treatment Plant (GWTP) Update</td>
</tr>
<tr>
<td>06:40</td>
<td>Sitewide Environmental Restoration Issues (RMZ)</td>
</tr>
<tr>
<td></td>
<td>- Environmental Contract Ending</td>
</tr>
<tr>
<td></td>
<td>- Surface Water Sampling Update</td>
</tr>
<tr>
<td></td>
<td>- Termination of perimeter well sampling</td>
</tr>
<tr>
<td>06:50</td>
<td>Next RAB Meeting Schedule and Closing Remarks</td>
</tr>
<tr>
<td>07:00</td>
<td>Adjourn (RMZ)</td>
</tr>
</tbody>
</table>
Longhorn Army Ammunition Plant Restoration Advisory Board Meeting
July 27, 2017

AECOM
DATE: Thursday, July 27, 2017
TIME: 6:00 – 7:00 PM
PLACE: Karnack Community Center, Karnack, Texas

06:00 Welcome and Introduction

06:05 Open Items {RMZ}
- RAB Administrative Issues
- Minutes (January 2017 RAB Meeting)
- Ongoing Outreach/Website

06:15 Defense Environmental Restoration Program (DERP) Update {AECOM}
- LHAAP-04 ROD
- LHAAP-16 RD
- Groundwater Treatment Plant (GWTP) Update

06:40 Sitewide Environmental Restoration Issues {RMZ}
- Environmental Contract Ending
- Surface Water Sampling Update
- Termination of perimeter well sampling

06:50 Next RAB Meeting Schedule and Closing Remarks

07:00 Adjourn {RMZ}
Ongoing Outreach - Notifications for October RAB Meeting

- Published RAB meeting announcement in Marshall News Messenger on July 13, 2017

- Requested the following radio stations to air January RAB Meeting Public Service Announcement (PSA):
  - KMHT Radio 103.9 (Karnack)
  - 98 Rocks (Alpha Media, Shreveport) and
  - Kiss Country 93.7 (Town Square Media, Shreveport)

- Requested PSA to be placed on KTBS Channel 3, KTAL Channel 6 TV, KSLA Channel 12 Community/Local Events Calendar

- Sent RAB announcement/agenda by email or USPS to individual RAB members and other interested parties

- Mailed RAB announcement to churches in Karnack on July 13, 2017

- Posted RAB Meeting Fliers at multiple locations in the community:
  - Shady Glade Café, Caddo Grocery, Fyffes Corner Store, Circle S Grocery, Run In Grocery, Family Dollar Store, Convenience Store at FM9 and FM199
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.longhornnap.com
- Make suggestions for improving communication – the Army welcomes and appreciates community feedback
Minutes from Past RAB Meetings

Discussion of January 2017 RAB Meeting Minutes/Motion to accept
Website Update

Longhorn
Army Ammunition Plant
Environmental Restoration Program

The next RAB meeting will be held on Thursday, July 27, 2017 at 6:00 PM at the Karnack Community Center. Click on Calendar for Meeting Agenda and Details.
LHAAP Fact Sheets

- LHAAP-16 RD Fact Sheet – July 14, 2016
- LHAAP-17 RD Fact Sheet – July 14, 2016
- LHAAP-16 RD Fact Sheet – April 2017

Get Involved Links
- Restoration Advisory Board
- Meeting Schedule
- Meeting Minutes
- CERCLA Investigation and Remediation Process
- LHAAP Fact Sheets «
- Final Record of Decisions (RODs) Approved
Website Update

Longhorn Army Ammunition Plant
Environmental Restoration Program

Final Record of Decisions (RODs) Approved

- Notice of Availability of Final Records of Decision for LHAAP-16, LHAAP-17, LHAAP-001-R, and LHAAP-003-R
- Notice of Availability of Final Record of Decision for LHAAP-04

Get Involved Links

- Restoration Advisory Board
- Meeting Schedule
- Meeting Minutes
- CERCLA Investigation and Remediation Process
- LHAAP Fact Sheets
- Final Record of Decisions (RODs) Approved
Site-wide Environmental Restoration Issues

Active LHAAP Performance-Based Remediation Sites

<table>
<thead>
<tr>
<th>Site Code</th>
<th>Site Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHAAP-03</td>
<td>Building 722 Paint Shop</td>
</tr>
<tr>
<td>LHAAP-04</td>
<td>Pilot Wastewater Treatment Plant</td>
</tr>
<tr>
<td>LHAAP-12</td>
<td>Landfill 12</td>
</tr>
<tr>
<td>LHAAP-16</td>
<td>Landfill 16</td>
</tr>
<tr>
<td>LHAAP-17</td>
<td>Burning Ground No.2/Flashing Area</td>
</tr>
<tr>
<td>LHAAP-18</td>
<td>Burning Ground No.3</td>
</tr>
<tr>
<td>LHAAP-24</td>
<td>Unlined Evaporation Pond</td>
</tr>
<tr>
<td>LHAAP-29</td>
<td>Former TNT Production Area</td>
</tr>
<tr>
<td>LHAAP-37</td>
<td>Chemical Laboratory Waste Pad</td>
</tr>
<tr>
<td>LHAAP-46</td>
<td>Plant Area 2</td>
</tr>
<tr>
<td>LHAAP-47</td>
<td>Plant Area 3</td>
</tr>
<tr>
<td>LHAAP-50</td>
<td>Former Sump Water Tank</td>
</tr>
<tr>
<td>LHAAP-58</td>
<td>Maintenance Complex</td>
</tr>
<tr>
<td>LHAAP-67</td>
<td>Aboveground Storage Tank Farm</td>
</tr>
<tr>
<td>LHAAP-001-R</td>
<td>South Test Area/Bomb Test Area</td>
</tr>
<tr>
<td>LHAAP-003-R</td>
<td>Ground Signal Test Area</td>
</tr>
</tbody>
</table>
LHAAP-04 – Final Record of Decision

ÅLHAAP-04 ï Former Pilot Wastewater Treatment Plant
- 0.5 acres
- Wastewater treatment began in 1984
- Plant demolished in 1997
- Mercury and perchlorate contaminated soil excavated and disposed off-site in 2009
- Perchlorate detected in shallow zone groundwater at concentrations exceeding the TRRP Tier 1 residential groundwater PCL

ÅFinal Record of Decision (ROD)
- Signed by Army BRAC December 15, 2017
- Concurrence by TCEQ February 7, 2017
- Signed by EPA March 30, 2017
Remedial Action Objectives (RAOs)

- Protect human health by preventing ingestion of groundwater contaminated with perchlorate;
- Return groundwater to its potential beneficial use, wherever practicable, within a reasonable time period given the particular site circumstances; and
- Prevent groundwater contaminated with perchlorate from migrating into nearby surface water.

Selected Remedy:

- In-Situ Bioremediation (ISB);
- Long-Term Monitoring (LTM) of Groundwater; and
- Land Use Controls (LUCs):
  - Maintain integrity of remedial or monitoring systems
  - Prevent use of groundwater as potable water source
  - Restrict land use to nonresidential
• Initial Notice of Land Use Controls to Public Officials sent June 26, 2017

• Public Notice of Availability of ROD
  - Marshall Newspaper publication
  - Mailouts via USPS to local officials
  - LHAAP Website

• Copy of the Final ROD is available to the public at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670
  - Library hours are 10:00 A.M. to 8:00 P.M. Monday through Thursday, and 10:00 A.M. to 5:30 P.M. Friday and Saturday.

• Copies of Responsiveness Summaries and Fact Sheets at sign-in table.

• For more information, contact Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951; phone number 479-635-0110; e-mail rose.m.zeiler.civ@mail.mil.
LHAAP-04 – Post-ROD Schedule

Post ROD Schedule
- Draft Remedial Design – March 2018
- Draft Remedial Action Work Plan – August 2018
LHAAP-16 – Remedial Design

ÅLHAAP-16 Landfill
- Landfill received solid and industrial waste until 1980s
- Harrison Bayou located along northeastern edge of site
- COCs are trichloroethene [TCE], cis-1,2-dichloroethene [DCE], vinyl chloride [VC]), perchlorate, and five metals
- In 1996 and 1997 a groundwater extraction system was installed as a treatability study to prevent the groundwater plume from migrating to Harrison Bayou
- Final ROD issued September 2016
- Selected remedy: cap maintenance, ISB, Biobarriers, Monitored Natural Attenuation (MNA), and LUCs

ÅLHAAP-16 Remedial Design finalized January 2017
LHAAP-16 – Remedial Design

LHAAP-16 Remedial Design

- Landfill Cap Maintenance
  - Monitor, maintain, and repair the existing landfill cap, as necessary.
  - Perform cap inspections annually or as needed to evaluate vegetation, erosion, settlement, and drainage system.

- In-Situ Bioremediation (ISB)
  - Emulsified vegetable oil will be used to reduce contaminant concentration in most contaminated portion of Shallow and Intermediate Zone groundwater (referred to as Mid-Plume ISB).

- Biobarriers (ISB)
  - Three (3) biobarriers installed in shallow zone groundwater immediately downgradient of landfill (Biobarriers #1, #2, #3).
  - One (1) biobARRIER near Harrison Bayou in Shallow Zone groundwater to prevent contaminated groundwater from seeping into the bayou.
LHAAP-16 – Remedial Design

ÅLHAAP-16 Remedial Design (continued)

- Performance Monitoring/MNA
  - First two years:
    - Monitor groundwater in the areas of active ISB to evaluate its effectiveness and to assess changes in groundwater geochemistry, concentrations of COCs, and their degradation products.
    - Perform quarterly groundwater monitoring to evaluate changes in concentrations of COCs and their degradation products in the areas outside the influence of active ISB. The eight quarters will be used to evaluate if MNA is effective, or if contingency action should be initiated.
  - If MNA is shown to be effective based on the first two years of data, implement LTM on a semiannual frequency for three years, then annually until the next five-year review.
LHAAP-16 – Remedial Design

ÅLHAAP-16 Remedial Design (continued)

- Land Use Controls
  - Prohibit access to contaminated groundwater except for environmental monitoring and testing;
  - Preserve the integrity of the landfill cap and restrict intrusive activities (e.g., digging) that would degrade or alter the cap;
  - Restrict land use to nonresidential; and
  - Maintain the integrity of any current or future remedial or monitoring systems.
  - LUCs will remain in place as long as the landfill waste remains at the site or until the levels of COCs and COC by-products (i.e., including all hazardous substances, pollutants, and contaminants found at the site at cleanup levels) allow for unlimited use and unrestricted exposure.
LHAAP-16 – Remedial Design (continued)

- Land Use Controls Implementation
  - Initial Notice: Initial notices of soil and groundwater contamination and land use restrictions were submitted to federal, state and local governments involved, and owners and occupants of properties subject to LUCs.
  - Finalizing LUC Boundaries: LUC boundaries will be finalized, approved by TCEQ and EPA, and a legal description appended to the survey plat.
  - Recording: LUCs will be recorded in Harrison County records.
  - Notification: The Texas Department of Licensing and Regulation will be notified of the LUCs.
LHAAP-16 – Remedial Design

LHAAP-16
Landfill BiobARRIER #2 Design

Legend

- Existing In-Situ Bioremediation Injection/Extraction/Performance Monitoring Well
- Existing Monitored Natural Attenuation Performance Monitoring Well
- Other Existing Monitoring Well
- Target In-Situ Reaction Zone Based on Design Radius of Influence

LHAAP-16 Landfill
LHAAP-16 – Remedial Design

LHAAP-16
Landfill BiobARRIER #3 Design

Legend

- Existing Shallow Monitoring Well
- Proposed Shallow Well Location
- IW -- Injection Well Location
- RW - Recovery Well Location
- Proposed Direct Push Injection Point
- Target In-Situ Reaction Zone Based on Design Radius of Influence
LHAAP-16 – Remedial Design

LHAAP-16
Bayou Biobarrier Design

Legend
- Proposed Direct Push Injection Point
- Proposed Shallow Well Location
- IIW = Injection Well
- RW = Recovery Well Location
- Existing Shallow Monitoring Well Location
- Groundwater Flow Direction Without Extraction (Shallow Zone)
- Target In-Situ Reaction Zone Based on Design Radius of Influence
LHAAP-16 – Remedial Design

LHAAP-16
Intermediate Mid Plume
GW ISB Design

Legend
- Existing Intermediate Injection/Extraction/Monitoring Well (EW well)
- Existing Intermediate Monitoring Well (WW)
- Proposed Intermediate Zone Injection/Monitoring Well (IW)
- Proposed Intermediate Zone Monitoring Well (WW)

Intermediate Zone Situ Bioremediation Area
Groundwater Treatment Plant (GWTP) Update

- Acid spill occurred in December 2016. Spilled materials were contained and neutralized within the GWTP.
- GWTP was put into internal recycle mode (limited extraction, limited discharge) until perchlorate levels were below discharge limits in March 2017.
- Extraction and discharge rates were gradually increased in April 2017 with increased monitoring to ensure compliance.
- Ion exchange scavenger system was installed in May 2017.
- Since May 2017, the GWTP has been extracting, treating, and discharging water at normal flow rates.
Deliverables, Environmental Contract Ending

- Current AECOM PBR contract ends September 30, 2017
- The remaining AECOM contract deliverables (reports and plans) are:
  - Final LHAAP-29 Feasibility Study (FS)
  - Final LHAAP-12 2016 RAO
  - Groundwater Treatment Plant Operation and Reporting
Surface Water Sampling Locations
Surface Water Sampling

Surface Water Samples - Perchlorate

Perchlorate Screening Criteria - Texas Risk Reduction Program (TRRP) Tier 1
Groundwater Residential Protective Concentration Level (PCL) 17 micrograms per liter

GPW - Goose Prairie Creek
HBW - Harrison Bayou
Perimeter Well Sampling

A decision was made by the FFA representatives on January 31, 2017 regarding the perimeter well sampling that has been taking place as a requirement of the 1999 Unanimous Decision of the Dispute Resolution Committee.

AFFA representatives agreed that perimeter well sampling should be discontinued.
Perimeter Well Sampling

Perimeter sampling discontinued. Last samples collected Nov/Dec 2016.
Next RAB Meeting Schedule and Closing Remarks

• Schedule October 2017 RAB Meeting
• Other Issues/Remarks?
Questions?
**Site History**
LHAAP-04, known as Site 04 or the former pilot wastewater treatment plant, is approximately 0.5 acres and is located in the central portion of LHAAP at the northwest corner of 6th and 60th Streets near the former fire station. LHAAP-04 is surrounded by light duty roads. Wastewater treatment operations began at LHAAP-04 in 1984. The demolition of the former pilot wastewater treatment facility structures, tanks, and piping, and the disposal of the associated wastes were completed in the summer of 1997 as part of the Resource Conservation and Recovery Act (RCRA) closure of the plant. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program, excavation of soil impacted with mercury and perchlorate at the LHAAP-04 site was completed in 2009 along the southern edge of the slab, which formerly housed storage tanks for the former pilot wastewater treatment facility. The Final ROD was issued in March 2017 with a selected remedy of in-situ bioremediation (ISB), long-term monitoring (LTM) of groundwater, and land use controls (LUCs).

**Site Characteristics**
Goose Prairie Creek runs approximately 700 feet to the south of LHAAP-04. The site consists of soils with mixed layers of mostly silts and clay with some thin layers of sands. The shallow zone water bearing sand at monitoring well 04WW04 appears to be only one to two feet thick with the surrounding monitoring wells mostly showing clay or silt layers at the same depth. No monitoring wells have been completed in the intermediate or deep saturated zones at LHAAP-04. Based on 2010 groundwater measurements, the groundwater flow direction in the shallow saturated zone below LHAAP-04 flows away from monitoring well 04WW02 in all directions. The regional groundwater flow direction beneath the facility is generally east-northeast towards Caddo Lake.

**Chemical of Concern (COC)**
The COC is perchlorate in groundwater.

**Description of the Selected Remedy**

**In-Situ Bioremediation (ISB):**
ISB in the groundwater next to monitoring well 04WW04 will be performed. ISB involves the addition of a carbon source into the shallow zone to promote naturally occurring biological processes to reduce perchlorate concentrations to below its cleanup level. In addition, subsurface injections of microorganisms in the shallow zone will also be conducted as needed to reduce the perchlorate levels.

**Long-Term Monitoring (LTM):**
LTM will be conducted to confirm that perchlorate concentrations in groundwater are declining through treatment to attain the groundwater cleanup level.

**LUCs include:**
- Maintain the integrity of any current or future remedial or monitoring systems until these components of the remedy are no longer needed to achieve the groundwater cleanup levels.
- Prohibit the use of groundwater as a drinking water source until the levels of COCs in the soil and groundwater allow for unlimited use and unrestricted exposure.
- Restrict the land to nonresidential usage until the levels of COCs in surface and subsurface soil and groundwater allow for unlimited use and unrestricted exposure.

**CERCLA Five Year Reviews**
Five-Year reviews will be performed to document that the remedy remains protective of human health and the environment.
LHAAP-04, Former Pilot Wastewater Treatment Plant
SELECTED REMEDY: In-Situ Bioremediation, Groundwater Long-Term Monitoring, and Land Use Controls
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)

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

<table>
<thead>
<tr>
<th>Month</th>
<th>Oct-08</th>
<th>Nov-08</th>
<th>Dec-08</th>
<th>Jan-09</th>
<th>Feb-09</th>
<th>Mar-09</th>
<th>Apr-09</th>
<th>May-09</th>
<th>Jun-09</th>
<th>Jul-09</th>
<th>Aug-09</th>
<th>Sep-09</th>
</tr>
</thead>
<tbody>
<tr>
<td>808,322</td>
<td>636,306</td>
<td>727,492</td>
<td>391,898</td>
<td>695,343</td>
<td>802,656</td>
<td>894,731</td>
<td>962,121</td>
<td>1,257,977</td>
<td>1,314,924</td>
<td>1,041,495</td>
<td>1,136,547</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Month</th>
<th>Oct-09</th>
<th>Nov-09</th>
<th>Dec-09</th>
<th>Jan-10</th>
<th>Feb-10</th>
<th>Mar-10</th>
<th>Apr-10</th>
<th>May-10</th>
<th>Jun-10</th>
<th>Jul-10</th>
<th>Aug-10</th>
<th>Sep-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>956,567</td>
<td>705,805</td>
<td>849,712</td>
<td>811,679</td>
<td>668,281</td>
<td>1,090,348</td>
<td>817,325</td>
<td>900,338</td>
<td>916,552</td>
<td>784,369</td>
<td>652,524</td>
<td>733,456</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>748,102</td>
<td>658,250</td>
<td>684,903</td>
<td>865,453</td>
<td>725,000*</td>
<td>730,000*</td>
<td>980,000*</td>
<td>630,000*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>349,012</td>
<td></td>
</tr>
</tbody>
</table>

*Indicates Estimate

### Water Treated Monthly from June 2012 through June 2017

![Graph showing water treated monthly from June 2012 through June 2017]
The pounds of chemicals removed for the 4th Quarter of 2016 and 1st and 2nd Quarters of 2017 can be found below and are calculated by the following formula:

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

**Approximate Amount of Pounds of Chemicals Removed From LHAAP-18/24**

<table>
<thead>
<tr>
<th>Date</th>
<th>Trichloroethylene</th>
<th>Methylene Chloride</th>
<th>Perchlorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-16</td>
<td>45.65</td>
<td>7.08</td>
<td>73.49</td>
</tr>
<tr>
<td>Nov-16</td>
<td>41.21</td>
<td>5.44</td>
<td>67.39</td>
</tr>
<tr>
<td>Dec-16</td>
<td>16.85</td>
<td>4.40</td>
<td>28.05</td>
</tr>
<tr>
<td>Jan-17</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Feb-17</td>
<td>0.59</td>
<td>0.47</td>
<td>0.32</td>
</tr>
<tr>
<td>Mar-17</td>
<td>5.82</td>
<td>4.67</td>
<td>11.28</td>
</tr>
<tr>
<td>Apr-17</td>
<td>33.28</td>
<td>23.41</td>
<td>57.60</td>
</tr>
<tr>
<td>May-17</td>
<td>70.38</td>
<td>49.51</td>
<td>62.35</td>
</tr>
<tr>
<td>Jun-17</td>
<td>72.52</td>
<td>51.02</td>
<td>69.34</td>
</tr>
</tbody>
</table>

ND – no data available

---

**GWTP Pounds of Chemicals Removed**

<table>
<thead>
<tr>
<th>Date</th>
<th>Trichloroethylene</th>
<th>Methylene Chloride</th>
<th>Perchlorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-16</td>
<td>45.65</td>
<td>7.08</td>
<td>73.49</td>
</tr>
<tr>
<td>Nov-16</td>
<td>41.21</td>
<td>5.44</td>
<td>67.39</td>
</tr>
<tr>
<td>Dec-16</td>
<td>16.85</td>
<td>4.40</td>
<td>28.05</td>
</tr>
<tr>
<td>Jan-17</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Feb-17</td>
<td>0.59</td>
<td>0.47</td>
<td>0.32</td>
</tr>
<tr>
<td>Mar-17</td>
<td>5.82</td>
<td>4.67</td>
<td>11.28</td>
</tr>
<tr>
<td>Apr-17</td>
<td>33.28</td>
<td>23.41</td>
<td>57.60</td>
</tr>
<tr>
<td>May-17</td>
<td>70.38</td>
<td>49.51</td>
<td>62.35</td>
</tr>
<tr>
<td>Jun-17</td>
<td>72.52</td>
<td>51.02</td>
<td>69.34</td>
</tr>
</tbody>
</table>

---

**Water Discharge Location and Volume (Gallons)**

<table>
<thead>
<tr>
<th>Month</th>
<th>Harrison Bayou</th>
<th>LHAAP-18/24 Sprinklers</th>
<th>INF Pond</th>
<th>INF Pond to Harrison Bayou</th>
<th>Contract Hauled Off-Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-16</td>
<td>0</td>
<td>642,876</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nov-16</td>
<td>0</td>
<td>576,898</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dec-16</td>
<td>0</td>
<td>236,688</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jan-17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Feb-17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14,355</td>
</tr>
<tr>
<td>Mar-17</td>
<td>127,242</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14,400</td>
</tr>
<tr>
<td>Apr-17</td>
<td>113,038</td>
<td>0</td>
<td>236,821</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>May-17</td>
<td>205,665</td>
<td>0</td>
<td>534,155</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jun-17</td>
<td>467,830</td>
<td>0</td>
<td>294,550</td>
<td>490,574</td>
<td>0</td>
</tr>
</tbody>
</table>
## 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)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>3rd</th>
<th>4th</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>1st</th>
<th>2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPW-1</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>0.318 J</td>
<td>&lt;1 U</td>
<td>0.155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPW-3</td>
<td>0.474</td>
<td>0.457</td>
<td>0.141</td>
<td>0.563</td>
<td>&lt;1 U</td>
<td>0.274</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBW-1</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>0.318 J</td>
<td>&lt;1 U</td>
<td>0.155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBW-7</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>0.318 J</td>
<td>&lt;1 U</td>
<td>0.155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBW-10</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>&lt;0.2 U</td>
<td>0.318 J</td>
<td>&lt;1 U</td>
<td>0.155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NS** – not sampled  
**U** – non-detect  
**J** – Estimated  
**Dry** – no surface water
Perchlorate Screening Criteria - Texas Risk Reduction Program (TRRP) Tier 1
Groundwater Residential Protective Concentration Level (PCL) 17 micrograms per liter
LHAAP-04 Record of Decision Responsiveness Summary
3 RESPONSIVENESS SUMMARY

The Responsiveness Summary serves three purposes. First, it provides the U.S. Army, USEPA, and the TCEQ with information about community concerns with the Preferred Alternative at LHAAP-04 as presented in the Proposed Plan. Second, it shows how the public’s comments were considered in the decision-making process for selection of the remedy. Third, it provides a formal mechanism for the U.S. Army to respond to public comments.

The U.S. Army, the USEPA, and the TCEQ provide information regarding LHAAP-04 through public meetings, the Administrative Record for the facility, and announcements published in the Marshall News Messenger newspapers. Section 2.3 discusses community participation on LHAAP-04, including the dates for the public comment period, the date, location, and time of the public meetings, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record:

- Transcript of the public meeting on January 9, 2013
- Presentation slides from the January 9, 2013 public meeting
- Written questions and comments from the public during the public comment period, and the U.S. Army response to those comments.

3.1 Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including the public and community groups that were received in written or verbal form.

3.1.1 Question/Recommendation No. 1

Extent of groundwater contamination: The only monitor well at the site, well 04WW04, contains high concentrations of perchlorate. This well is only 18 feet deep. A single well is insufficient. Both the lateral and vertical extent of groundwater contamination are unknown.

Recommendation: The three additional monitor wells the U.S. Army plans to install will better define the extent of contamination.

Response – The LHAAP-04 site is currently monitored by a total of seven wells, although only one well is technically within the very small area of the site (approximately 150 feet by 150 feet). The site is well-monitored as the remainder of the wells are within 250 feet of the impacted well. Three additional wells planned for installation as part of the RD will help further refine the perchlorate plume footprint and depth of contamination.

3.1.2 Question/Recommendation No. 2

Groundwater Contaminants: Samples from well 04WW04 do not appear to have been analyzed for contaminants other than perchlorate. Other groundwater contaminants may be present.

Recommendation: The U.S. Army should sample all monitor wells and the fire station well for all contaminants that might reasonably be expected to occur at the site. In addition to perchlorate, this would include volatile organic compounds (VOCs) (e.g., methylene chloride, trichloroethylene, explosives (e.g., TNT, DNT), and metals (e.g., arsenic, thallium). If
contaminants are found that are not amenable to restoration under the Proposed Plan (e.g., metals), the U.S. Army should modify the plan to ensure that all the contaminants will be cleaned up.

**Response** – Groundwater samples from three shallow monitoring wells (04WW01, 04WW02, and 04WW03) were analyzed for VOCs, SVOCs, metals, pesticides, PCBs, explosives, perchlorate, and dioxins/furans during the RI (Jacobs, 2003). No VOCs, SVOCs, perchlorate, pesticides, explosives, and PCBs were detected in the samples. Inorganic constituent concentrations were detected at or lower than the protective concentration level (PCL) or background comparison levels. Eight dioxin/furan compounds (with no established MCL or PCL) were detected in groundwater samples (Jacobs, 2003). Subsequently, perchlorate was identified as the only groundwater COC at the site with its source being historical perchlorate impacts in soil. Parameters, other than those discussed in the Proposed Plan and the ROD, will not be added to the monitoring program.

### 3.1.3 Question/Recommendation No. 3

**Residual soil contamination:** The U.S. Army has stated that contaminated soil probably remains beneath some portions of the site.

**Recommendation:** The U.S. Army should either perform an assessment to determine whether the contaminated soil is likely to be a source of groundwater contamination, or explain why such an assessment is not necessary.

**Response** – Residual contaminated soil, if any, is likely to be restricted to the two grid areas FL09 and FL11 (where confirmation samples could not be collected due to groundwater infiltration). Contaminated soil was removed from these two areas up to depths of 14 ft bg. However, samples collected from the remaining north side wall just above the groundwater interface indicated perchlorate concentrations less than cleanup levels. Residual soil contamination, if any, is likely to be in the saturated zone and will be addressed as part of groundwater remedy.

### 3.1.4 Question/Recommendation No. 4

**Concrete slab:** The U.S. Army does not appear to have investigated the soil or groundwater beneath the concrete slab.

**Recommendation:** The U.S. Army should either perform an investigation, or explain why it is not necessary.

**Response** – The concrete slab was penetrated in six locations near the tank pad/ foundations. See Figure 2-2 of the Final Removal Action Work Plan (Shaw, 2009c). Based on perchlorate results from soil samples taken under the slab, a section of the concrete was removed. See Figure 2-1 and Figure 2-8 of the Final Completion Report (Shaw, 2011). Soil was excavated to a depth of five feet below top of concrete in section FL08 and to a depth of twelve feet below top of concrete in section FL07. Perchlorate concentrations in final floor confirmation samples from FL07 and FL08 were less than the GWP-Ind MSC. Monitoring well 04WW04 is located adjacent to the concrete slab and soil removal at section FL07. Therefore, further investigation beneath the concrete slab is not warranted.
3.1.5 **Question/Recommendation No. 5**

**Perchlorate cleanup standard:** The U.S. Army’s cleanup standard for perchlorate in groundwater is the same as the State of Texas’ standard for industrial use (GWP-Ind): 72 µg/L. However, the USEPA has decided to regulate perchlorate under the SDWA and has established an Interim Drinking Water Health Advisory of 15 µg/L. The USEPA and the Army are currently discussing this issue.

**Recommendation:** Pending the outcome of discussions with the USEPA, the Army should assume that the perchlorate cleanup will be 15 µg/L, and plan accordingly.

**Note** – The purpose of excavating the perchlorate contaminated soils was to protect the underlying groundwater. A more stringent perchlorate groundwater standard may mean that the cleanup standards for soils will also have to be more stringent.

**Response** – The cleanup level for perchlorate is 17 µg/L, which is the TRRP Tier 1 Groundwater Residential PCL. The cleanup level for perchlorate was revised as a result of dispute resolution between the Army and the EPA.

3.1.6 **Question/Recommendation No. 6**

**Surface water modeling:** The U.S. Army has concluded that contaminated groundwater will not adversely affect surface water in Goose Prairie Creek. This conclusion is based on modeling performed in 2007. However, in its Proposed Plan for LHAAP-47, the U.S. Army stated that the uncertainties associated with the model were unacceptable, and it would not be used to assess the effect of groundwater contaminants on Goose Prairie Creek.

**Recommendation:** The U.S. Army should explain why it is using the model at LHAAP-04 but not at LHAAP-47.

**Response** – References to use of surface water modeling for LHAAP-04 will be removed from this and the future documents. Surface water directly overlies the LHAAP-47 plume and surface water monitoring is planned in conjunction with the final remedy for that site. At LHAAP-04 surface water is not located on the site directly on top of the groundwater plume. It is located ~700 feet from the site and based upon the localized, small nature of the plume, no impact to surface water is anticipated. Surface water data from 2010 and 2011 indicates perchlorate concentrations below TRRP Tier 1 Groundwater Residential PCL.

3.1.7 **Question No. 7**

**Public Comment Period:** What is the duration of the public comment period? When does the public comment period end?

**Response** – The duration of the public comment period is 30 days. The period began on January 1, 2013, and was extended through January 31, 2013.

3.1.8 **Question No. 8**

**Cleanup Level for Perchlorate in Groundwater:** The U.S. Army proposes that the cleanup level for perchlorate in groundwater be 72 µg/L whereas the USEPA states that the cleanup level for perchlorate shall be 15 µg/L. The U.S. Army may have to switch over and use 15 µg/L as the cleanup level.
Response – The cleanup level for perchlorate is 17 µg/L, which is the TRRP Tier 1 Groundwater Residential PCL. The cleanup level for perchlorate was revised as a result of dispute resolution between the Army and the EPA.

3.1.9 Question No. 9

Growth of Microorganisms during ISB: How do you encourage the growth of microorganisms? What is the relationship between microorganisms’ growth and reduction in contaminants?

Response – The material (substrate) that is injected into the aquifer during ISB provides the food source for the growth of native microorganisms in the aquifer. These microorganisms increase in population (via reproduction) and during the corresponding metabolism, they break down the contaminants in groundwater.

Perchlorate, the COC in groundwater at LHAAP-04 site is more amenable to ISB than some other contaminants found at the LHAAP. Evaluation of data collected quarterly in the first two years of the ISB implementation will help determine need for additional injections (additional substrate into the aquifer), or bioaugmentation culture (to add/enhance the right type of microbes into the aquifer). Providing the substrate (food source) to the microbes helps sustain and grow their population with corresponding decrease in the COC levels until the cleanup level is attained.

3.1.10 Question No. 10

Submittal of Questions and Appropriate Response: If someone sends in written comments to the U.S. Army, who does it go to, who actually reads them, who responds, do they respond to all comments?

Response – Dr. Rose Zeiler, with the U.S. Army is the point of contact for correspondence associated with comments/responses. Dr. Zeiler’s official contact information (mail, email, and telephone no.) is provided in the Proposed Plan. Formal comments are accepted verbally at the public meeting or via email or mail sent to the attention of Dr. Zeiler. All written comments on the Proposed Plan should be submitted to her. Verbal comments asked during the public meeting are captured by the court reporter. A concerted response from the team is provided to the comments and included in the Responsiveness Summary of the ROD. Similar questions are grouped together and a comprehensive answer is provided to that group of questions.

3.2 Technical and Legal Issues

This section is used to expand on technical and legal issues. However, there are no issues of that nature beyond the technical issues already discussed in Section 3.1.