



DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
POST OFFICE BOX 220  
RATCLIFF, AR 72951

August 27, 2018

DAIM-ODB-LO

Mr. Rich Mayer  
US Environmental Protection Agency  
Federal Facilities Section R6  
1445 Ross Avenue  
Dallas, TX 75202-2733

Re: Draft Final Remedial Action Completion Report, Contingency Remedy for Western Plume LHAAP-35A (58), Shops Area, Group 4, Longhorn Army Ammunition Plant, Karnack, Texas, August 2018

Dear Mr. Mayer,

The above-referenced document is being transmitted to you for your records and includes revisions based upon your comments on the Draft. In accordance with the FFA, the Draft Final will be considered Final after 30 days without further comment.

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) on behalf of the Army as part of Bhate's Performance Based Remediation contract for the facility. I ask that Kim Nemmers, Bhate's Project Manager, be copied on any communications related to the project.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

A handwritten signature in black ink that reads "Rose M. Zeiler".

Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

Copies furnished:

A. Palmie, TCEQ, Austin, TX  
P. Bruckwicki, Caddo Lake NWR, TX  
A. Williams, USACE, Tulsa District, OK  
N. Smith, USAEC, San Antonio, TX  
K. Nemmers, Bhate, Lakewood, CO (for project files)



DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
POST OFFICE BOX 220  
RATCLIFF, AR 72951

August 27, 2018

DAIM-ODB-LO

Ms. April Palmie  
Texas Commission on Environmental Quality Superfund Section, MC-136  
12100 Park 35 Circle, Bldg D  
Austin, TX 78753

Re: Draft Final Remedial Action Completion Report, Contingency Remedy for Western Plume LHAAP-35A (58), Shops Area, Group 4, Longhorn Army Ammunition Plant, Karnack, Texas, August 2018

Dear Ms. Palmie,

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The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

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A handwritten signature in cursive script that reads "Rose M. Zeiler".

Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

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R. Mayer, USEPA Region 6, Dallas, TX  
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A. Williams, USACE, Tulsa District, OK  
N. Smith, USAEC, San Antonio, TX  
K. Nemmers, Bhate, Lakewood, CO (for project files)

**Responses to Comments on  
Draft Remedial Action Completion Report at LHAAP-35A(58), Shops Area  
Longhorn Ammunition Plant, Karnack, Texas**

1. Respondent Concur (C), Does Not Concur (D), Takes Exception (E), or Delete (X).  
2. Commenter Agrees (A) with response or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment (August 13, 2018)	C, D, E or X <sup>1</sup>	Response (August 27, 2018)	A or D <sup>2</sup>	Comment	C, D, E or X <sup>1</sup>	Response	A or D <sup>2</sup>
<b>Reviewer:</b> April Palmie, TCEQ <b>Respondent:</b> Kim Nemmers, Bhate									
1	Page 1-4, First sentence, Section 1.3	Please revise the first sentence since EISB is a "contingency remedy" for only the western plume	C	The first paragraph in Section 1.3 will be revised to state: <i>The plume for the LHAAP-35A (58) site exists in two separate geographic areas: 1) eastern plume; and 2) western plume. <b>Figure 1-3</b> shows monitoring wells installed within the western plume area at the LHAAP-35A (58) site. The contingency remedy of EISB described herein applies to the western plume only.</i>					
2	Page 2-1, Section 2.1	Please revise the second sentence. As written, it seems like a table was completed to meet substantive requirements, rather than the requirements included in the table.	C	Concur. The second sentence in Section 2.1 will be revised to state: <i>The requirements described in Table 2-11, Description of ARARs for Selected Remedy requirements (USACE, September 2010), of the ROD were also completed prior to the EISB injections.</i>					
3.	Page 2-3, Section 2.7	I think the 2nd sentence in the 2nd paragraph (about nitrite) is supposed to be in the 4th paragraph. Clarify - 35AWW24 didn't have any anion or nitrite exceedances	C	Due to revised laboratory data packages, nitrite detections were determined to be false positives (see Response to EPA Comment 4 below for further explanation). Discussion on nitrite will be removed since no nitrite was detected in the groundwater samples analyzed.					
4.	Figure 2-1	Figures should include all wells within the scale of the map, not just those sampled or measured.	C	<b>Figure 2-1</b> will be revised to include all monitoring wells at LHAAP-58.					
		<b>END of TCEQ Comments</b>							

**Responses to Comments on  
Draft Remedial Action Completion Report at LHAAP-35A(58), Shops Area  
Longhorn Ammunition Plant, Karnack, Texas**

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<b>Reviewer:</b> Richard Mayer, USEPA, Region 6 <b>Respondent:</b> Kim Nemmers, Bhate									
1	Appendix B	<b>Appendix B, Monitoring Well Installation Information:</b> Are the high DO and positive ORP results for newly installed monitoring wells 35AWW23 and 35AWW24 due to the development and surging of the wells? Please explain.	C	The positive ORP is typical at LHAAP-58 for areas of the plume that have not received an electron donor in the form of a carbon substrate. The following sentence will be added to Section 2.3: <i>Elevated dissolved oxygen (DO) levels were observed during development of these two new monitoring wells due to the surging of the wells. The DO was significantly lower during the baseline groundwater sampling event completed in March 2018, as documented in the groundwater sample collection forms presented in Appendix C.</i>					
2	Appendix C	<b>Appendix C, Groundwater Collection Forms:</b> Also, please add what type of samples were collected for documentation.	C	The sampling forms provided in the Draft Final document will be corrected to include the analysis. In addition, the March 2018 groundwater sample collections forms will be placed into a separate Appendix from the laboratory data reports to avoid confusion should the data packages be provided electronically only. Section 2.7 presents the laboratory analysis for the baseline sampling event but the March 2018 collection date will be clarified. The following sentences will be revised/added to Section 2.8.1: <i>On April 4, 2018, the DO and oxidation reduction potential (ORP) were measured in monitoring wells 35AWW11, 35AWW20, and LHSMW07 as part of a field screening event to verify reducing conditions. The field logs for the water quality evaluation following substrate injections are presented in Appendix E. No offsite groundwater analysis was completed during this April 2018 field screening event.</i>					
3	Page 1-1, Third Paragraph	Please add the AECOM, May 2016 reference to the reference page. Also, the Driscoll reference can be removed from references since it is not used anywhere in text.	C	Section 4, References, will be revised to include the AECOM, May 2016 reference as well as remove the Driscoll, F.6., 1986 reference.					
4	Page 2-3 and Table 2-2, Section 2.7, Second Paragraph	Nitrite is not a COC for this site or any other sites, but there are several wells exceeding the MCL at this site. EPA recommends listing the wells in this paragraph that had MCL exceedances for nitrite. Please explain why nitrite would exceed MCLs at this plume? These results were taken before any in-situ injections.	C	Due to revised laboratory data packages, nitrite detections were determined to be false positives. Discussion on nitrite will be removed since no nitrite was detected in the groundwater samples analyzed.  The false positive occurred because the carbonate peak eluted right at the retention time of nitrite, causing the analyst to believe that it was the nitrite peak. Since the nitrite standard and sample had					

**Responses to Comments on  
Draft Remedial Action Completion Report at LHAAP-35A(58), Shops Area  
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				<p>similar retention times and were within peak window criteria it raised no red flags. Additionally, no QC issues were encountered during data validation that would infer any chromatography problems arose. Once the peaks were evaluated using zoom mode, the detection of nitrite was determined to be a false positive.</p> <p>Due to this analyst error, the laboratory is requiring analysts to verify any sample that has a hit for nitrite using zoom mode. In addition, the laboratory will verify each nitrite detection via method 353.2 (Colorimetric, Cadmium reduction).</p>					
5		<b>Figure 2-1:</b> EPA would recommend using more than 6 wells for developing the groundwater contours in the future. EPA recommends collecting water levels at additional wells for better control on the northern and southern areas as well as the in-between wells.	C	Only baseline monitoring wells were evaluated in the RACR. RA(O) reports will include water levels from additional monitoring wells.					
		<b>END of EPA Comments</b>							

**DRAFT FINAL REMEDIAL ACTION COMPLETION  
REPORT CONTINGENCY REMEDY FOR WESTERN  
PLUME LHAAP-35A (58), SHOPS AREA, GROUP 4  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS**

**AUGUST 2018**

Prepared For:  
**U.S. Army Corps of Engineers  
Tulsa District  
1645 S 101 E Avenue  
Tulsa, Oklahoma 74128-4609**

Contract No: W9128F-13-D-0012  
Delivery Order No: W912BV17F0150

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*Note: Table 1-1 is within the text of the document*

**Appendices**

- Appendix A Survey Report
- Appendix B Monitoring Well Installation Information
- Appendix C Groundwater Sample Collection Forms
- Appendix D Baseline Groundwater Sampling Analytical Results
- Appendix E Field Logs for Water Quality Evaluation
- Appendix F Quality Control Summary Report

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## ACRONYMS AND ABBREVIATIONS

AECOM	AECOM Technical Services, Inc.	mL	Milliliter
ARAR	Applicable or Relevant and Appropriate Requirements	MNA	Monitored Natural Attenuation
bgs	Below ground surface	MSC	Medium-Specific Concentration
Bhate	Bhate Environmental Associates, Inc.	msl	Mean sea level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	mV	Millivolts
COC	Chemical of concern	NCP	National Oil and Hazardous Substances Contingency Plan
DCA	Dichloroethane	NPL	National Priorities List
DCE	Dichloroethene	ORP	Oxidation Reduction Potential
DHB	Dehalobacter	PCE	Tetrachloroethene
DHC	Dehalococcoides	PPE	Personal protective equipment
DO	Dissolved oxygen	psi	Pounds per square inch
DoD	Department of Defense	RACR	Remedial Action Completion Report
DPT	Direct push technology	RAO	Remedial Action Objective
EISB	Enhanced in-situ bioremediation	RA(O)	Remedial action-operation
EVO	Emulsified Vegetable Oil	RAWP	Remedial Action Work Plan
FFA	Federal Facility Agreement	ROD	Record of Decision
ft	Feet or foot	Shaw	Shaw Environmental, Inc.
gpm	Gallons per minute	SOP	Standard operating procedure
IDM	Investigation-derived material	TCA	Trichloroethane
Jacobs	Jacobs Engineering Group, Inc.	TCE	Trichloroethene
LHAAP	Longhorn Army Ammunition Plant	TCEQ	Texas Commission on Environmental Quality
LTM	Long-Term Monitoring	TOC	Total Organic Carbon
LUC	Land Use Control	U.S. Army	U.S. Department of the Army
MCL	Maximum Contaminant Level	USEPA	U.S. Environmental Protection Agency
µg/L	Micrograms per liter	UU/UE	Unrestricted use and unlimited exposure
mg/L	Milligrams per liter	VC	Vinyl chloride
		VOC	Volatile Organic Compound

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# 1 INTRODUCTION

The former Longhorn Army Ammunition Plant (LHAAP) is an inactive, government-owned, formerly contractor operated and maintained, Department of Defense (DoD) facility located in central east Texas (**Figure 1-1**) in the northeast corner of Harrison County. LHAAP is approximately 14 miles northeast of Marshall, Texas, and approximately 40 miles west of Shreveport, Louisiana. The former United States Department of the Army (U.S. Army) installation occupied 8,416 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake. The facility can be accessed via State Highways 43 and 134.

LHAAP was placed on the United States Environmental Protection Agency (USEPA) National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination began in 1990. After its listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the Texas Commission on Environmental Quality [TCEQ]) entered into a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §120 Federal Facility Agreement (FFA) for remedial activities at LHAAP. The FFA became effective on December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property. The majority of LHAAP has been transferred by the U.S. Army to the U.S. Fish and Wildlife Service for management as the Caddo Lake National Wildlife Refuge.

Remedial activities are required under the Record of Decision (ROD) issued for the LHAAP-35A (58) site in September 2010 (U.S. Army Corps of Engineers [USACE], September 2010). The Remedial Action Work Plan (RAWP) for the entire site was prepared in August 2013 (AECOM Technical Services, Inc. [AECOM], August 2013) in accordance with the ROD and was implemented in September 2013. The monitored natural attenuation (MNA) remedy for the western plume at this site, as presented in the ROD, calls for an evaluation of the remedy after 2 years of MNA remedial action-operation (RA(O)) implementation. The ROD also provides for implementation of a contingency remedy to enhance MNA if MNA is found to be ineffective. RA(O) implementation for the site was completed between October 2013 and October 2015 and the 2<sup>nd</sup> year RA(O) report was finalized in May 2016 (AECOM, May 2016). After 2 years of MNA, the 2<sup>nd</sup> year RA(O) report concluded that MNA is ineffective and implementation of a contingency remedy was appropriate. The contingency remedy for the western plume at the site is enhanced in-situ bioremediation (EISB). The RAWP was revised to change the substrate from a sodium lactate to an emulsified vegetable oil (EVO) and was approved as a Revised Final RAWP (Bhate Environmental Associates, Inc. [Bhate], January 2018). Therefore, this Remedial Action Completion Report (RACR) presents the EISB implemented for the groundwater plume located on the western side of the site, in accordance with the Revised Final RAWP (Bhate, January 2018).

## 1.1 Organization of Remedial Action Completion Report

This report is comprised of the following sections:

## RACR - WESTERN PLUME

### LHAAP-35A (58) SHOPS AREA

- Section 1: “Introduction” presents the site background, contingency remedy including the chemicals of concern (COCs) and their respective cleanup levels, the nature and extent of contamination, site geology and hydrogeology, Remedial Action Objectives (RAOs), and the Land Use Control (LUC) Plan.
- Section 2: “Enhanced In-Situ Bioremediation Implementation” describes the injection of amendments to enhance microbial degradation of contaminants and groundwater monitoring associated with EISB in the western plume.
- Section 3: “Remedy Performance Evaluation and Reporting” describes the EISB performance evaluation reporting and five-year reviews to be performed for the contingency remedy.
- Section 4: “References” provides a list of references cited in this document.

Activities specified in this RACR were conducted in accordance with the Installation-Wide Work Plan (AECOM, July 2014) and the Revised Final RAWP (Bhate, January 2018).

## 1.2 LHAAP-35A (58) Background

The LHAAP-35A (58) site, also known as the Shops Area, is located in the north-central portion of LHAAP and currently covers an area of approximately 11 acres (**Figure 1-2**) (USACE, September 2010). The surface features include asphalt-paved roads, a parking area, and areas that are wooded and overgrown with grasses and other vegetation. The topography is relatively flat with the surface drainage flowing into the tributaries of Goose Prairie Creek, which eventually discharges into Caddo Lake.

The Shops Area, which is now designated as LHAAP-35A (58), was established in 1942 as part of the installation’s initial construction (Shaw Environmental Inc. [Shaw], September 2011). The facility was used to provide plant-operated laundry, automotive, woodworking, metalworking, painting, refrigeration, and electrical services. The site was active throughout the LHAAP’s mission and was deactivated along with the rest of the installation in 1996-1997. The LHAAP-35A (58) site boundary has changed over the years. Earlier investigations for LHAAP-35A (58) were performed in areas to the south that are no longer included within the site boundary. LHAAP-35A (58) includes the following sites:

- LHAAP-02, vacuum truck overnight parking;
- LHAAP-03, Paint Shop Building 722 (waste collection);
- LHAAP-60D, Former Storage Building 714;
- LHAAP-68, mobile storage tank parking area; and
- LHAAP-69, service station with underground storage tanks.

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

The following sites were within the historical LHAAP-35A (58) site boundary, but are not within the current site boundary:

- LHAAP-04, former Pilot Wastewater Treatment Plant
- LHAAP-56, vehicle wash rack and oil/water separator Building 744-A
- LHAAP-59, Storage Building 725
- LHAAP-60A, Building 411
- LHAAP-61, Water Treatment Plant
- LHAAP-66, Building 401-A

The following sites are within the LUC boundary for LHAAP-35A (58):

- LHAAP-02, vacuum truck overnight parking;
- LHAAP-03, Paint Shop Building 722 (waste collection);
- LHAAP-56, vehicle wash rack & oil/water separator Building 744-A
- LHAAP-59, Storage Building 725
- LHAAP-60D, Former Storage Building 714;
- LHAAP-65, Former Building 209 (flammable materials storehouse);
- LHAAP-68, mobile storage tank parking area; and
- LHAAP-69, service station with underground storage tanks.

LHAAP-60A, Building 411, which is located within the historical site boundary of LHAAP-35A (58), will be included within the final LUC boundary for LHAAP-04.

Between 1992 and 2015, multiple investigations were conducted in a phased approach to determine the nature and extent of contamination at LHAAP-35A (58). In 2009, a Feasibility Study was completed, which included a natural attenuation evaluation (Shaw, December 2009). These investigations concluded that the Shallow Zone groundwater was impacted with Volatile Organic Compounds (VOCs), however, the soil and former sump areas posed no unacceptable threat to human health or the environment (Shaw, September 2011).

The previous remedy implemented at LHAAP-35A (58) was developed and selected in accordance with the CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP) (40 Code of Federal Regulations Part 300). The selected remedy, finalized in the ROD was developed based on the industrial land use scenario, which is consistent with the anticipated future use as a national wildlife refuge (USACE, September 2010). A deed notice was recorded at the Harrison County Courthouse stating that the site is suitable for non-residential use. A groundwater use restriction was also recorded in the Harrison County Courthouse to ensure that

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LHAAP-35A (58) SHOPS AREA

there is no withdrawal or use of groundwater beneath the site for anything other than environmental monitoring and testing until the cleanup levels are met. A restriction against residential use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UU/UE). The restriction and notification encompasses the sites within the LUC boundary of LHAAP-35A (58) listed above.

### 1.3 Contingency Remedy for the Western Plume at LHAAP-35A (58)

The plume for the LHAAP-35A (58) site exists in two separate geographic areas: 1) eastern plume; and 2) western plume. **Figure 1-3** shows monitoring wells installed within the western plume area at the LHAAP-35A (58) site. The contingency remedy of EISB described herein applies to the western plume only.

As discussed in the ROD and in the 2<sup>nd</sup> Annual Remedial Action Operation Report (AECOM, May 2016), the western groundwater plume at LHAAP-35A (58) is impacted with the following COCs: tetrachloroethene (PCE); trichloroethene (TCE); 1,1-dichloroethene (DCE); cis-1,2-DCE; and vinyl chloride (VC).

The Safe Drinking Water Act Maximum Contaminant Levels (MCLs) will be used as cleanup levels for VOCs in groundwater, as presented in **Table 1-1**.

**Table 1-1: Groundwater Cleanup Levels**

COC	Concentration (µg/L)	Basis
PCE	5	MCL
TCE	5	MCL
1,1-DCE	7	MCL
cis-1,2-DCE	70	MCL
VC	2	MCL
1,1,2-Trichloroethane <sup>(a)</sup>	5	MCL
1,2-Dichloroethane <sup>(a)</sup>	5	MCL
Notes: µg/L – micrograms per liter <sup>(a)</sup> Not currently classified as a constituent of concern, but will be included in the list of chemicals for Long-Term Monitoring		

In the western plume area, the highest concentrations of COCs have been observed in the Shallow Zone groundwater near monitoring well 35AWW20, which is located in the former vehicle wash rack and oil/water separator Building 744-A area (**Figure 1-3**). This area is also within the primary target area of the western plume, which is located in the western portion of the western plume, near wells 35AWW20, LHSMW07, and 35AWW06. In addition, 1,1-DCE has been detected above its MCL in monitoring wells 35AWW11 and 35AWW19, located on the eastern and southern boundaries of the western plume, respectively. The western plume contingency remedy includes EISB in the area with the highest levels of contamination.

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

The remedy for the western plume at LHAAP-35A (58) is intended to protect human health and the environment by preventing human exposure to the contaminated groundwater and preventing contaminated groundwater from migrating into nearby surface water. The final western plume remedy consists of LUC, EISB, MNA (ensuing EISB), and Long Term Monitoring (LTM)/Five-year Reviews.

The specific remedy components presented in the Final ROD (USACE, 2010) are discussed below:

- LUC in the impacted area will ensure protection of human health by restricting the use of groundwater to environmental monitoring and testing until cleanup levels are met. The LUC restricting residential use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow for UU/UE.
- EISB implemented in the western plume area. At LHAAP-35A (58), the highest concentrations of contaminants have been observed in the Shallow Zone groundwater in the vicinity of wells 35AWW20, LHSMW07, and 35AWW06. This area is designated as the western plume primary target area (**Figure 1-3**). EISB was also implemented near monitoring wells 35AWW11, 35AWW14, and near one proposed new monitoring well (35AWW23) location. EISB is the process of removing contaminant mass as a result of microbes utilizing contaminants in the groundwater during respiratory or metabolic activities. The treatment involves injecting amendments which may include microbial cultures, electron donor sources, and nutrients, into the subsurface.
- MNA constitutes a passive remedy that relies on natural biological, chemical, and physical processes that act to reduce the mass and concentrations of groundwater contaminants under favorable conditions. MNA will be implemented to verify that the western VOC plume is stable or shrinking and will not migrate to nearby surface water at levels that pose an unacceptable risk to human health or the environment. Natural attenuation is expected to reduce contaminant concentrations to their respective clean-up levels, and return groundwater to its beneficial use, wherever practicable, after the successful implementation of the EISB. MNA will be evaluated annually, with groundwater monitoring performed on a quarterly basis for 2 years. The groundwater monitoring data will be used to evaluate the effectiveness of EISB in meeting the RAOs and to determine if a second round of injections is necessary. Experience from the eastern plume indicates that one event is sufficient to achieve significant reduction in chlorinated VOCs. After the end of performance monitoring for EISB, the monitoring schedule for the western plume target area will be aligned with the schedule for the rest of the western plume.
- LTM/Five-year Reviews: If MNA is effective (after the 2 years of quarterly sampling), MNA monitoring will be performed at a semi-annual frequency for the following 3 years, then annually until the next Five-Year Review. LTM will continue at least once every 5 years until cleanup levels are achieved. A cleanup time has not been estimated for the western plume and will be evaluated following implementation of EISB.

## 1.4 Site Geology and Hydrogeology

The surface geology at LHAAP-35A (58) consists predominantly of clay and silty clays, with thin lenses of sand. The sand lenses are approximately 3 to 5 feet thick and the depth of occurrence varies across the site.

The site hydrogeology includes three water-bearing zones identified as the Shallow Zone, Intermediate Zone, and Deep Zone. The Shallow Zone extends to approximately 40 feet (ft) below ground surface (bgs). The lithology of the Shallow Zone is characterized by discontinuous, fine-grained layers of interbedded silt, sand, and clay.

The geology of the Intermediate and Deep Zones consists mostly of clay, with occasional silt and sand layers. The predominance of clay below the Shallow Zone creates a basal aquitard that impedes downward migration of groundwater from the Shallow Zone. Groundwater surface measurements for all three units are available for October 2013. The groundwater elevations for the Shallow Zone ranged from approximately 194 ft to 202 ft above mean sea level (msl). The elevation of the Intermediate Zone potentiometric surface was approximately 178 ft above msl, and the elevation of Deep Zone potentiometric surface was 175.75 ft above msl. The differences in groundwater elevations between the Intermediate and Deep Zones reflect an upward groundwater gradient between these two units.

Hydraulic conductivities in the Shallow Zone wells range from  $3.5 \times 10^{-5}$  to  $1.4 \times 10^{-3}$  centimeters per second (Jacobs Engineering Group, Inc. [Jacobs], January 2002). Using an estimated hydraulic gradient of 0.022 feet per foot and the range of hydraulic conductivities (Jacobs, 2002), the calculated groundwater flow velocity in the Shallow Zone ranges from 2.66 to 114 ft per year.

## 1.5 Remedial Action Objectives

The final remedy for groundwater at LHAAP-35A (58) will protect human health and meet Applicable or Relevant and Appropriate Requirements (ARARs). The site was determined to pose no significant ecological risks (Shaw, September 2011). The RAOs for LHAAP-35A (58) are consistent with the reasonably anticipated future use of the site as a national wildlife refuge and include:

- Protection of human health by preventing human exposure to the contaminated groundwater.
- Protection of human health and the environment by preventing contaminated groundwater from migrating to nearby surface water.
- Return of groundwater to its potential beneficial use as drinking water, wherever practicable.

## 1.6 Land Use Control Plan

The U.S. Army or its representatives are responsible for LUC implementation and certification, reporting, and enforcement. The U.S. Army will address any LUC problems within its control that are likely to impact remedy integrity as soon as practicable. The details of LUC components are provided in the RAWP (AECOM, August 2013). The continued successful implementation of LUC is presented in the annual RA(O) reports.

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## 2 ENHANCED IN-SITU BIOREMEDIATION IMPLEMENTATION

This section discusses the objectives and details implementation of EISB at Site LHAAP-35A (58) western plume only. EISB was performed in the western plume target area in March and April 2018. The purpose of EISB is to accelerate the rate of biological degradation of chlorinated ethenes and ethanes in the Shallow Zone groundwater. This area is characterized by relatively high concentrations of TCE; 1,1-DCE; cis-1,2-DCE; and VC.

In general, the EISB treatment implemented includes injection of a carbon substrate followed by an injection of a microbial consortium, which included dehalococcoides (DHC) and/or dehalobacter (DHB). It is well documented in the literature that DHC and DHB have demonstrated ability to reduce chlorinated ethenes and ethanes, respectively. The role of the carbon substrate is to provide a food source for indigenous and bio-augmented microorganisms. As the carbon substrate is metabolized by the microorganisms, hydrogen gas is produced, which provides available protons required for reductive dechlorination. Competing processes include those that involve other electron acceptors, such as oxygen and sulfate. Reductive dechlorination may be delayed until competing electron acceptors have sufficiently decreased to below competing levels.

During biological reductive dechlorination, the chlorinated ethenes (such as PCE) serve as an electron acceptor and chlorine atoms are sequentially replaced with protons to yield TCE; cis-1,2-DCE; VC; and ethene as daughter products. A common observation is that PCE and TCE are reductively dechlorinated under relatively mild reducing conditions (e.g., sulfate-reducing conditions), whereas reductive dechlorination of cis-1,2-DCE and VC generally require increasingly stronger reducing conditions (e.g. methanogenic conditions).

The following sections present the actions completed to implement the Revised Final RAWP (Bhate, January 2018). These include installation of two additional monitoring wells, baseline groundwater sampling, and EISB injections.

### 2.1 Substantive Requirements

Compliance with the substantive requirements of the Underground Injection Control Substantive Requirements for Class V Injection Well/Temporary Injection Points, 30 Texas Administrative Code Section 331.10, were met. The requirements described in Table 2-11, Description of ARARs for Selected Remedy requirements (USACE, September 2010), of the ROD were also completed prior to the EISB injections.

### 2.2 Site/Utility Clearance

Existing utility maps were used to locate subsurface utilities. The proposed locations of monitoring well borings and direct push technology (DPT) injection points were marked,

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

Underground Service Alert (One Call) was notified at least two working days prior to intrusive work, and the utility clearance standard operating procedures (SOPs) were followed.

### 2.3 Monitoring Well Installation

Per the Revised Final RAWP (Bhate, January 2018), two monitoring wells were installed on February 20, 2018, within the western portion of the site as shown on **Figure 1-3**. Monitoring well 35AWW23 is located southeast of 35AWW20 and was completed to a depth of 40.1 ft bgs. Monitoring well 35AWW24 is located downgradient of the plume to ensure plume definition and was completed to a depth of 32.1 feet bgs. Due to water not being observed nor saturated soils being encountered during the well installation at 35AWW23, the screen length is 15 feet. The screen length at monitoring well 35AWW24 is 10 feet. Following installation of the monitoring wells, registration was completed with the state of Texas licensed professional well driller. Well construction diagrams for these two new monitoring wells is presented in **Appendix B**.

The monitoring wells were developed on February 26 and 27, 2018, per the SOP. The forms documenting this development are presented in **Appendix B**. These two new monitoring wells were included in the baseline groundwater sampling event and the groundwater contour elevation assessment. Elevated dissolved oxygen (DO) levels were observed during development of these two new monitoring wells due to the surging of the wells. The DO was significantly lower during the baseline groundwater sampling event completed in March 2018, as documented in the groundwater sample collection forms presented in **Appendix C**.

### 2.4 Site Survey

The two new monitoring wells were surveyed by a licensed land surveyor. The survey activities (for location and elevation) were performed in accordance with the Installation-Wide Work Plan (AECOM, July 2014). The survey report is presented in **Appendix A**.

### 2.5 Investigation Derived Material

Investigation-derived material (IDM) generated during the investigation and monitoring activities included disposable sampling equipment, purge water, equipment decontamination fluids, drill cuttings, and used personal protective equipment (PPE). Drill cuttings are containerized and stored on-site pending analytical results and waste profiling. Groundwater purged from the monitoring well sampling was taken to the Groundwater Treatment Plant for treatment. Disposable sampling equipment and PPE was disposed of as general refuse. The IDM management, storage, and disposal was performed in accordance with the Installation-Wide Work Plan (AECOM, July 2014).

## 2.6 Groundwater Elevations and Flow Direction

During to the baseline groundwater sampling event in March 2018, the seven monitoring wells sampled in the western plume were measured for depth to water. The static depth of water varied from 18.97 to 31.03. Table 2-1 presents the groundwater elevation summary. Groundwater surface elevation contours for the Shallow Zone, based on March 2018 groundwater level measurements, are shown on Figure 2-1. Shallow groundwater flow within the western plume appears to be east – southeast.

## 2.7 Baseline Groundwater Sampling

A baseline groundwater sampling event was completed prior to EISB implementation to establish baseline COC concentrations and geochemical conditions. The sampling was specifically completed on March 7 and 8, 2018. A total of seven monitoring wells were sampled and included 35AWW06, 35AWW11, 35AWW19, 35AWW20, 35AWW23, 35AWW24, and LHSMW07. The baseline Groundwater Sample Collection Forms are presented in **Appendix C**. The data packages containing the analytical results from the offsite laboratory are presented in **Appendix D**. The results are presented in **Table 2-2** and are compared to the associated MCL/Medium-Specific Concentration (MSC). **Figure 2-2** presents the baseline analytical results on the site map. The baseline groundwater sampling results will be compared with monitoring results following substrate emplacement to assess the performance of EISB. The next performance monitoring event is planned for June 2018. Groundwater samples during the baseline event completed in March 2018 were analyzed for VOCs via USEPA Method 8260C by ALS Environmental and for the following biogeochemical parameters: alkalinity, common anions (chloride, sulfate, nitrate, nitrite), sulfide, Total Organic Carbon (TOC), dissolved iron and manganese, total phosphorus, carbon dioxide, dissolved gases (methane, ethane, and ethene), total iron and manganese, ferrous iron, volatile fatty acids, DHC, and DHB.

The baseline groundwater analytical results indicate that all but monitoring wells 35AWW06 and 35AWW24 exceeded the MCL for at least one chlorinated VOC. Monitoring well 35AWW24 was installed in February 2018 with the purpose of defining the extent of the plume. Based upon the initial baseline results, this RAWP goal was achieved.

The primary VOC exceedance was 1,1-DCE which has an MCL of 7 micrograms per liter ( $\mu\text{g/L}$ ). The maximum detection of 1,1-DCE was in monitoring well 35AWW20 at 2,300  $\mu\text{g/L}$  followed by LHSMW07 at 370  $\mu\text{g/L}$ . For monitoring wells 35AWW11 and 35AWW19, 1,1-DCE was the only analyzed VOC with an exceedance. Monitoring wells 35AWW20, 35AWW23, and LHSMW07 also had exceedances of TCE and vinyl chloride. Monitoring well 35AWW20 was the most impacted and was the only monitoring well sampled that had 1,1,2-trichlorethane (TCA) and benzene detected above the MCL of 5  $\mu\text{g/L}$ .

## RACR - WESTERN PLUME LHAAP-35A (58) SHOPS AREA

No anions were detected at levels that exceeded the screening levels in any of the monitoring wells sampled. Also, none of the screening levels for the metals iron and manganese or for the volatile fatty acid, propionic acid, were exceeded.

The bacteria analysis revealed that both DHC and DHB are currently present in the aquifer. At 35AWW20, both DHC and DHB is present with DHB present at 1,120 cells/milliliter (mL) and DHC at 5.5 cells/mL. DHC present in the aquifer during the baseline sampling event varied from non-detect in both monitoring wells 35AWW23 and 35AWW24 to 11.8 cells/mL in LHSMW07. DHB present in the aquifer varied from non-detect in monitoring wells 35AWW11, 35AWW19, 35AWW23, and LHSMW07 to 1,120 cells/mL in 35AWW20.

Only minor quality control issues were encountered in the validation process for this data. Namely, calibration recovery, matrix spike recovery, and field duplicate precision were qualified for being outside control limits and detailed in the Quality Control Summary Report provided in **Appendix F**. Otherwise the data quality objectives have been met for the project and the data are usable for the intended purpose.

## 2.8 EISB Injections

This section presents the EISB completed in March and April 2018. The remedy was implemented in two separate mobilizations. The first mobilization introduced the substrate to condition the aquifer ahead of bioaugmentation. The second mobilization included the injection of microbe populations of DHC and/or DHB.

The substrate and the bioaugmentation was injected into the subsurface through DPT injection points using a single point injection system. The injection system consisted of a bulk storage tank, mixing equipment, an injection pump, and volume metering and control equipment. The dilute substrate and bioaugmentation was pressure-fed into each injection point using a transfer pump and a portable polyethylene mixing tank.

For both the first and second mobilizations, the substrate solution was injected using a “bottom-up” approach at each proposed injection point at 1-foot intervals to cover the entire Shallow Zone groundwater treatment interval. Under this approach, the drill rods were advanced to the bottom portion of the injection interval. The DPT drill rods were pulled up exposing a stainless steel screen, between 2 and 5 ft in length, which acted as the temporary well screen. Injectate was then pumped down through the DPT drilling rods (acting as a temporary well casing) to the injection interval and injectate was forced through the stainless steel screen into the surrounding formation. The tools were then withdrawn to the next injection depth and the material again pumped through the rods. This cycle was repeated to provide coverage across the entire vertical treatment interval. Injection flow rates ranged from 5 to 10 gallons per minute (gpm) at injection pressures from 20 to 100 pounds per square inch (psi). Injections were conducted at the lowest pressure practical which yields an acceptable flow rate, which was 15 to 20 psi.

### 2.8.1 Substrate Injections

The substrate used at the LHAAP-58 western plume was SRS®-SD, Small Droplet EVO. An approximate working solution strength of 10 to 20 percent EVO-type substrate volume per volume of water was prepared in the field using a centrifugal pump. Deoxygenated water was used with the substrate to create the appropriate solution strength. The deoxygenated water was developed using sodium sulfite and water from the pump house serving the Groundwater Treatment Plant. The water used with the substrate was verified to have a DO of less than 0.5 milligrams per liter prior to use. The diluted substrate was injected into 36 injection points within the target treatment area as presented on **Figure 2-3** via 1-ft lifts from 30 to 20 ft bgs with a target volume of 24 gallons per foot over the 10 foot interval for a total of 240.96 gallons per point. **Table 2-3** presents the injection volumes by date and location.

Injections of the diluted substrate were completed from March 20, 2018, through March 25, 2018. On April 4, 2018, the DO and oxidation reduction potential (ORP) were measured in monitoring wells 35AWW11, 35AWW20, and LHSMW07 as part of a field screening event to verify reducing conditions. The field logs for the water quality evaluation following substrate injections are presented in **Appendix E**. No offsite groundwater analysis was completed during this April 2018 field screening event. The DO (0.0 mg/L in all three wells) and ORP (from -294 millivolts [mV] in 35AWW20 to -412 mV in LHSMW007) demonstrated reducing aquifer conditions (DO less than 1.0 mg/L and negative ORP) during this evaluation of the aquifer conditions following the conditioning injections. However, the pH was lower than ideal with pH varying from 4.88 to 5.61. This lower pH may inhibit the growth of the microbes but the relatively high alkalinity should provide some buffer over time. Both DHC and DHB were detected in the baseline groundwater samples presented in Section 2.7. Therefore, the natural occurrence of DHC and DHB prior to the implementation of the contingency remedy also supports that this lower pH is not likely a factor for survival of the bacteria.

### 2.8.2 Bioaugmentation Culture Injections

Based upon the baseline groundwater sampling, KB-1® Plus, a proprietary microbial culture comprised of a mix of DHC (bacteria well known for degradation of PCE/TCE; cis-1,2-DCE; and VC) and DHB (bacteria well known for degradation of TCA and 1,1-dichloroethane [DCA]) was injected in a portion of the plume while KB-1® was injected into the remaining portion of the plume. Only two monitoring wells (35AWW20 and LHSMW07) had 1,1-DCA present in the baseline samples. Therefore, the injection points upgradient of these monitoring wells received the KB-1® Plus specifically. Use of KB-1® Plus reduces the DHC within each canister to allow for the addition of DHB. Since DHB primarily degrades TCA and DCA, the KB-1® Plus was not appropriate for the entire site where PCE, TCE, and associated daughter products are biodegraded via DHC. Therefore, the remaining injection points used KB-1® which uses DHC only in the remaining injection points. The exception to this is that KB-1® Plus was also injected into R4-7 and R4-8 due to additional KB-1® Plus being available following injections in the intended points. **Table 2-3** presents the bioaugmentation by point, and **Figure 2-3** presents the location of the injection

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LHAAP-35A (58) SHOPS AREA

points with the points named to match with **Table 2-3** as well as the locations that received KB-1® versus KB-1® Plus.

Bioaugmentation was completed on April 10-12, 2018, after reducing conditions were established (see field logs in **Appendix E**). The bacteria was injected with deoxygenated water and substrate. Approximately 5 gallons per 1-ft interval was injected over a 30 to 20 ft bgs vertical point. To avoid bacteria kill, KB-1 primer was used to deoxygenate the water used in the bioaugmentation. Sodium sulfite, at high enough levels, can inhibit or kill off the bacteria. KB-1 primer uses sodium sulfite and amino acids to deoxygenate the water as well as reduce the ORP to less than -100 mV.

Bioaugmentation involved injecting the microbial culture (KB-1® and KB-1® Plus) via the direct push points located generally at the same locations where the EISB injections were performed. The injection tubing was advanced into the drive point at the desired injection depth and purged with argon or nitrogen gas to displace oxygen from the column. The culture was then injected into the drive point with the compressed gas.

The microbial culture was injected under pressure in the same target depth intervals as the carbon substrate solution. Small quantities of the carbon substrate solution were injected into the same points during bioaugmentation, so that a sufficient 'food source' was provided to the microbial culture as soon as it entered the subsurface environment.

### **3 REMEDY PERFORMANCE EVALUATION AND REPORTING**

Reporting will consist of formal annual reports, supplemented by distribution of validated data to the U.S. Army as they become available, to shorten the lag time between sampling and provide analytical results to the regulators.

#### **3.1 EISB Performance Monitoring**

Performance monitoring will be used to evaluate the effectiveness of the EISB treatment and to determine if additional substrate injections are necessary. The groundwater monitoring data will be used to evaluate the effectiveness of EISB in meeting the RAOs and to determine if a second round of injections is necessary.

Groundwater monitoring will be performed for eight quarterly events following implementation of EISB to demonstrate effectiveness of the EISB remedy. A total of six monitoring wells (35AWW20, LHSMW07, 35AWW06, 35AWW11, 35AWW19, and 35AWW23) are included in the EISB monitoring program for collection and analysis of groundwater samples for VOCs and biogeochemical parameters. These wells were selected for their placement relative to the VOC plumes to monitor the effectiveness of EISB at LHAAP-35A (58). Other monitoring wells included in the semi-annual sampling program for this site will continue to be sampled. The first performance monitoring event is planned for June 2018, which will be presented in the Annual RA(O) Report.

#### **3.2 EISB Evaluation**

Technical evaluations of EISB effectiveness will be performed at the end of the first year and the end of the second year. These evaluations will be documented in the Annual RA(O) Reports. The objective of the evaluations is to determine whether the injections in the western plume target area have been effective, or whether a second round of injections is needed to achieve RAOs. If there is a second round of injections, the design for the supplemental injections will be determined by the results of the groundwater sampling during performance monitoring. The Annual RA(O) Reports will be prepared as outlined in the Final Revised RAWP (Bhate, January 2018).

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LHAAP-35A (58) SHOPS AREA

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## 4 REFERENCES

AECOM Technical Services, Inc. (AECOM). August 2013. *Final Remedial Action Work Plan LHAAP-35A (58), Shops Area, Group 4 Longhorn Army Ammunition Plant, Karnack, Texas.*

AECOM. July 2014. *Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas.*

AECOM. May 2016. *Draft Final 2<sup>nd</sup> Annual Remedial Action Operation Report for LHAAP-35A (58), Shops Area at Longhorn Army Ammunition Plant, Karnack, Texas.*

Bhate Environmental Associates, Inc. January 2018. *Revised Final Remedial Action Work Plan Contingency Remedy for Western Plume, LHAAP-35A (58), Shops Area, Group 4, Longhorn Army Ammunition Plant, Karnack, Texas.*

Jacobs. January 2002. *Final Remedial Investigation Report for the Group 4 sites, Sites 35A, 35B, 35C, 46, 47, 48, 50, and 60, and Goose Prairie Creek, Longhorn Army Ammunition Plant, Karnack, Texas.*

Shaw. December 2009. *Final Feasibility Study, LHAAP-35A (58), Shops Area, Group 4, Karnack, Texas.*

Shaw. September 2011. *Final Remedial Design, LHAAP-35A (58), Shops Area, Group 4, Longhorn Army Ammunition Plant, Karnack, Texas.*

USACE. September 2010. *Record of Decision, LHAAP-35A (58), Shops Area, Group 4, Longhorn Army Ammunition Plant, Karnack, Texas.*

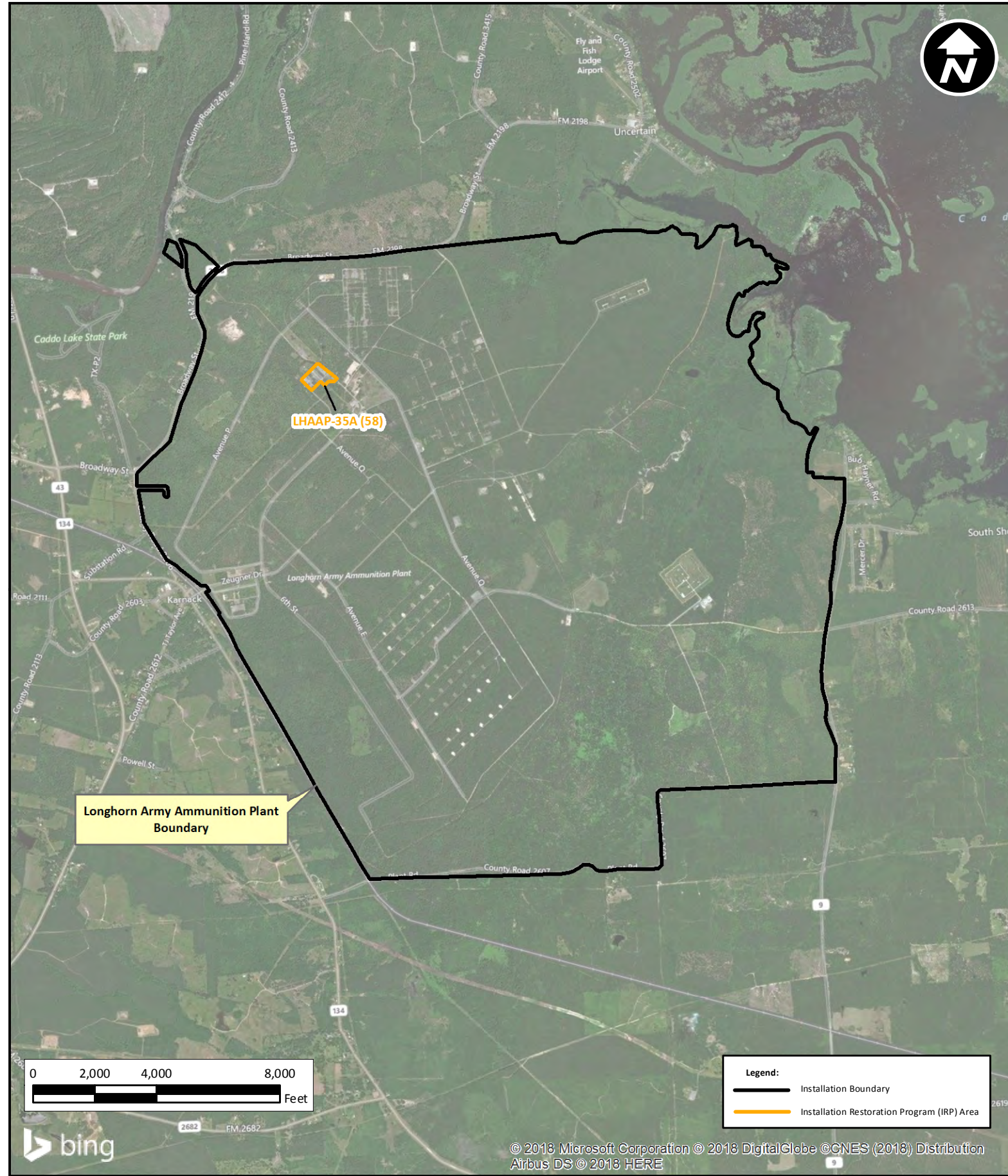
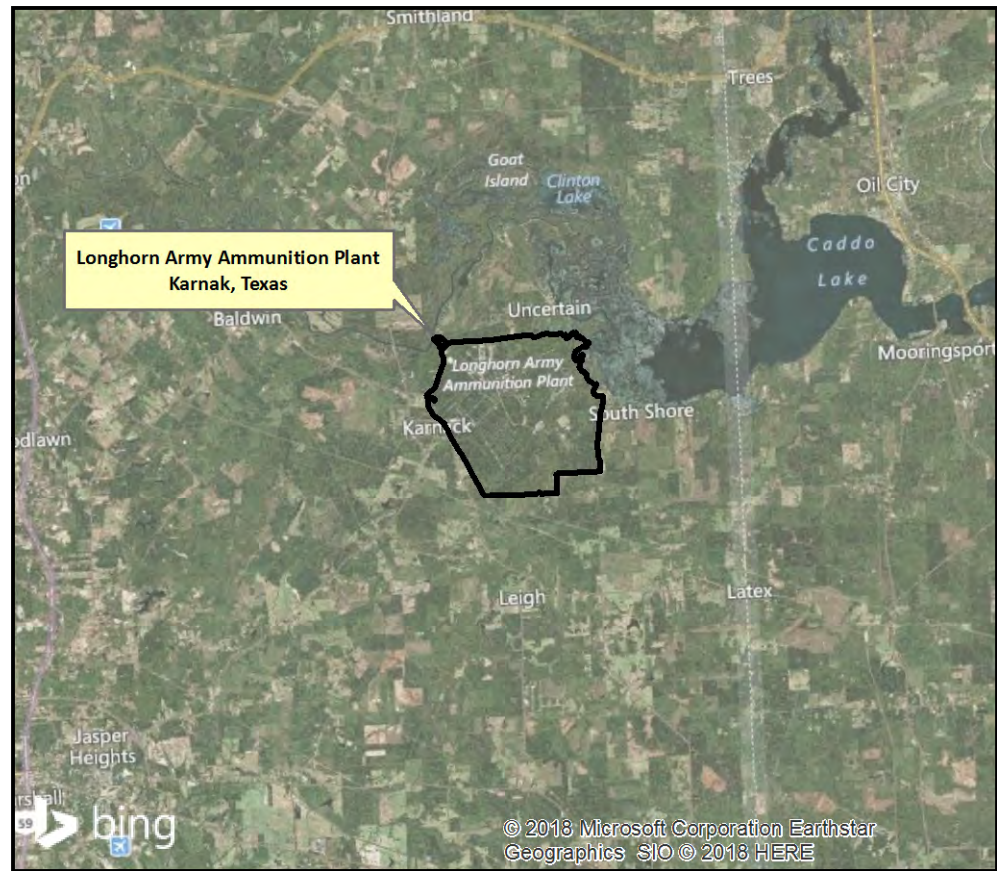
RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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## FIGURES

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LHAAP-35A (58) SHOPS AREA

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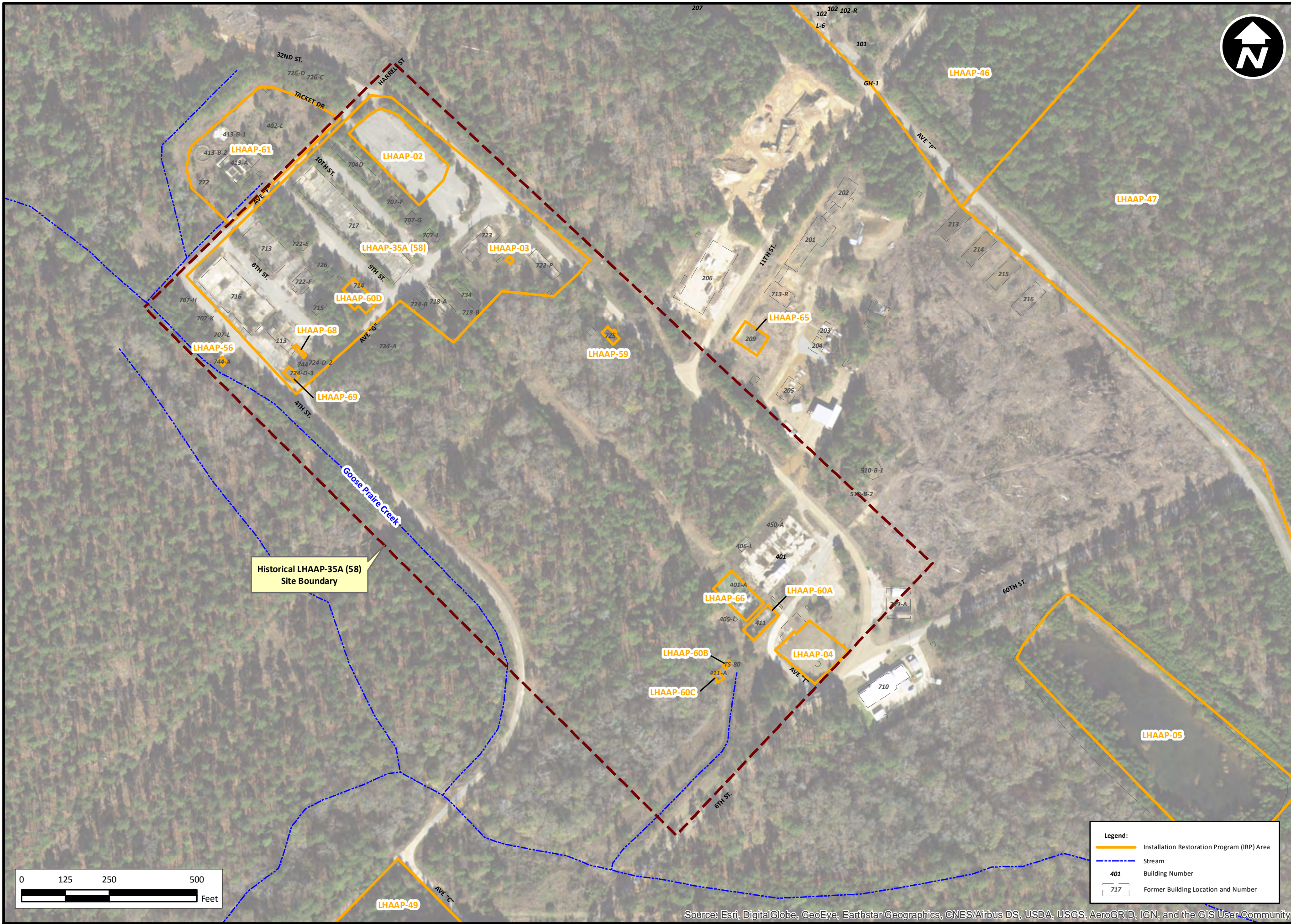
Site Area Map

Figure 1-1

LHAAP-35A (58) Remedial Action Completion Report  
 Contingency Remedy for Western Plume  
 Longhorn Army Ammunition Plant  
 Karnack, Texas

PROJECT NO: NWO1312.0150. 012.0001.02	SCALE: As Shown	DATE: 5/11/2018	DRAWN BY: MRM
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Historical LHAAP-35A (58) Site Boundary

**Legend:**

- Installation Restoration Program (IRP) Area
- Stream
- 401 Building Number
- 717 Former Building Location and Number

LHAAP-35A (58) Site Vicinity Map

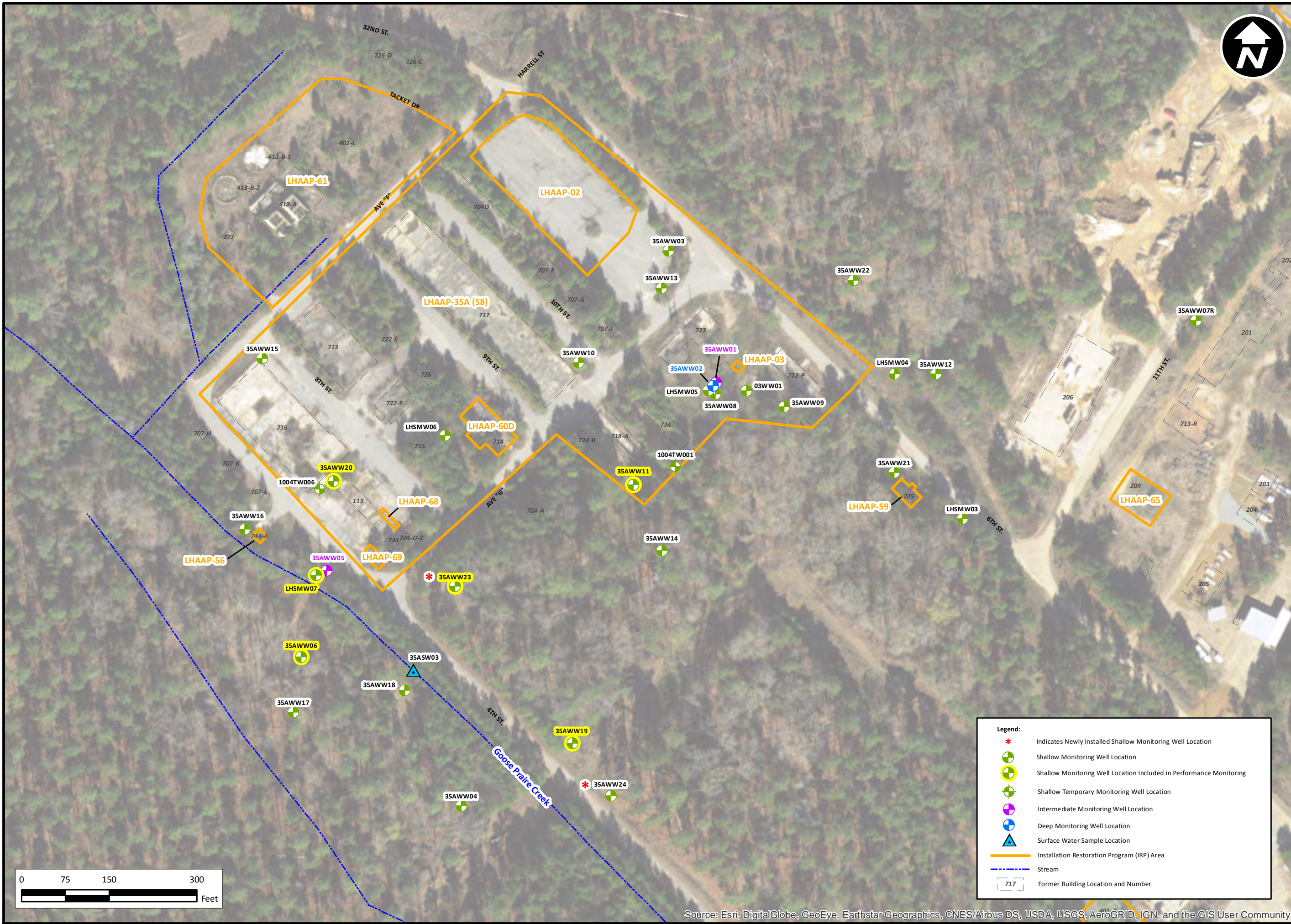
Figure 1-2

LHAAP-35A (58) Remedial Action Completion Report  
 Contingency Remedy for Western Plume  
 Longhorn Army Ammunition Plant  
 Karnack, Texas

PROJECT NO: NWO1312.0150. 012.0001.02	SCALE: As Shown	DATE: 5/11/2018	DRAWN BY: MRM
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Location of Performance Monitoring Wells for Western Plume

Figure 1-3

LHAAP-35A (58) Remedial Action Completion Report  
 Contingency Remedy for Western Plume  
 Longhorn Army Ammunition Plant  
 Karnack, Texas

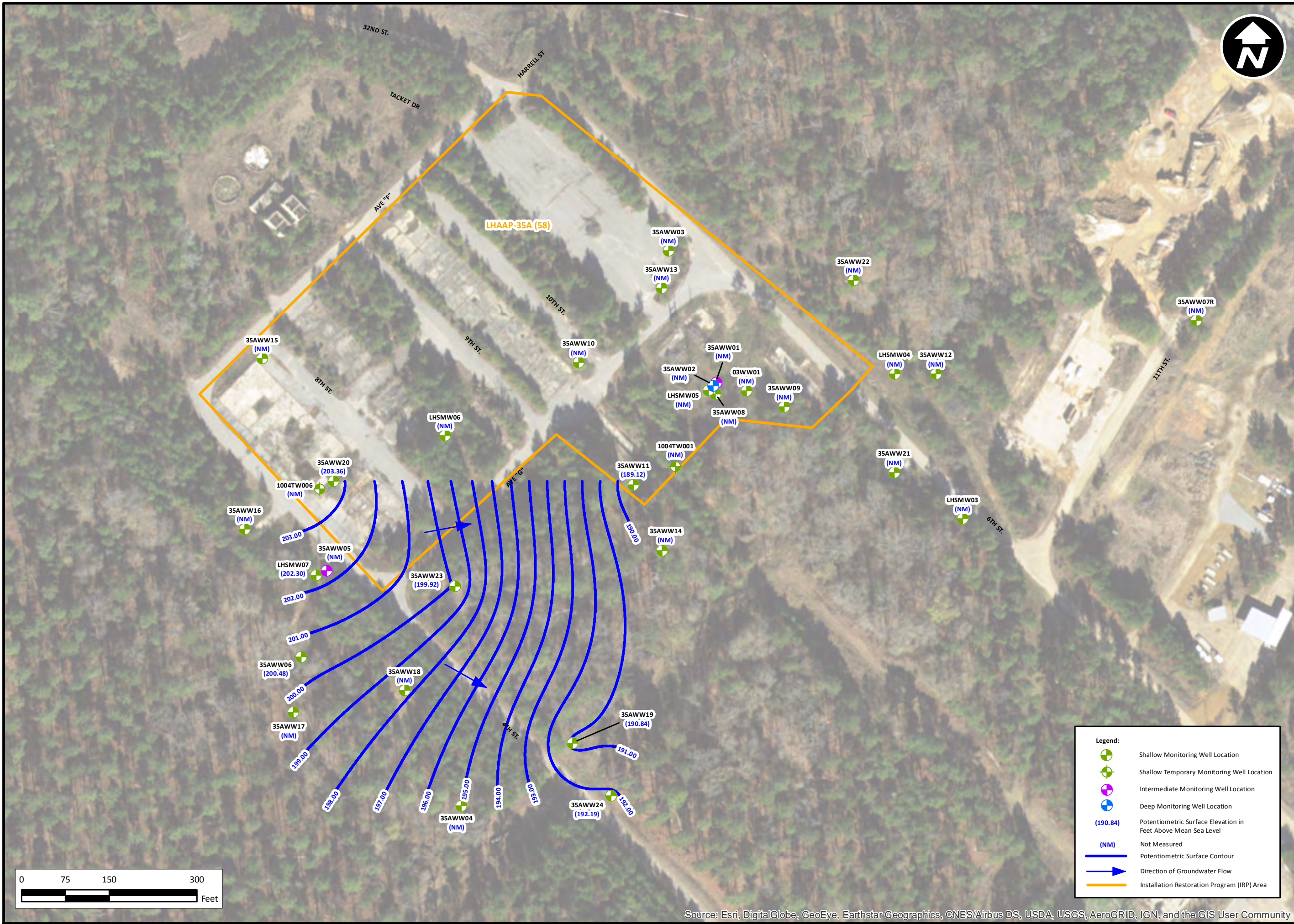
PROJECT NO: NWO1312.0150. 012.0001.02	SCALE: As Shown	DATE: 5/11/2018	DRAWN BY: MRM
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LHAAP-35A (58) Remedial Action Completion Report  
Contingency Remedy for Western Plume  
Longhorn Army Ammunition Plant  
Karnack, Texas

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**Legend**  
 J = Estimated value  
 U = Result is less than (<) the laboratory detection limit  
 COC = Chemical of Concern  
 MCL = Maximum Contaminant Level  
 DCE = Dichloroethene  
 PCE = Tetrachloroethene  
 TCE = Trichloroethene  
 VC = Vinyl Chloride  
**Bold** values are detected results  
**Red** values exceed the MCL  
 All results and MCLs are reported in micrograms per liter (µg/L)



35AWW20	3/7/2018	
COC	MCL	Result
1,1-DCE	7	<b>2,300</b>
cis-1,2-DCE	70	<b>76</b>
PCE	5	<5.0 U
trans-1,2-DCE	100	<5.0 U
TCE	5	<b>330</b>
VC	2	<b>110</b>

LHSMW07	3/7/2018	
COC	MCL	Result
1,1-DCE	7	<b>370</b>
cis-1,2-DCE	70	<b>11</b>
PCE	5	<1.0 U
trans-1,2-DCE	100	<1.0 U
TCE	5	<b>34</b>
VC	2	<b>5</b>

35AWW06	3/8/2018	
COC	MCL	Result
1,1-DCE	7	<b>2.6</b>
cis-1,2-DCE	70	<1.0 U
PCE	5	<1.0 U
trans-1,2-DCE	100	<1.0 U
TCE	5	<1.0 U
VC	2	<1.0 U

35AWW23	3/8/2018	
COC	MCL	Result
1,1-DCE	7	<b>13</b>
cis-1,2-DCE	70	<b>21</b>
PCE	5	<1.0 U
trans-1,2-DCE	100	<1.0 U
TCE	5	<b>27</b>
VC	2	<b>3.1</b>

35AWW19	3/8/2018	
COC	MCL	Result
1,1-DCE	7	<b>9</b>
cis-1,2-DCE	70	<1.0 U
PCE	5	<1.0 U
trans-1,2-DCE	100	<1.0 U
TCE	5	<1.0 U
VC	2	<1.0 U

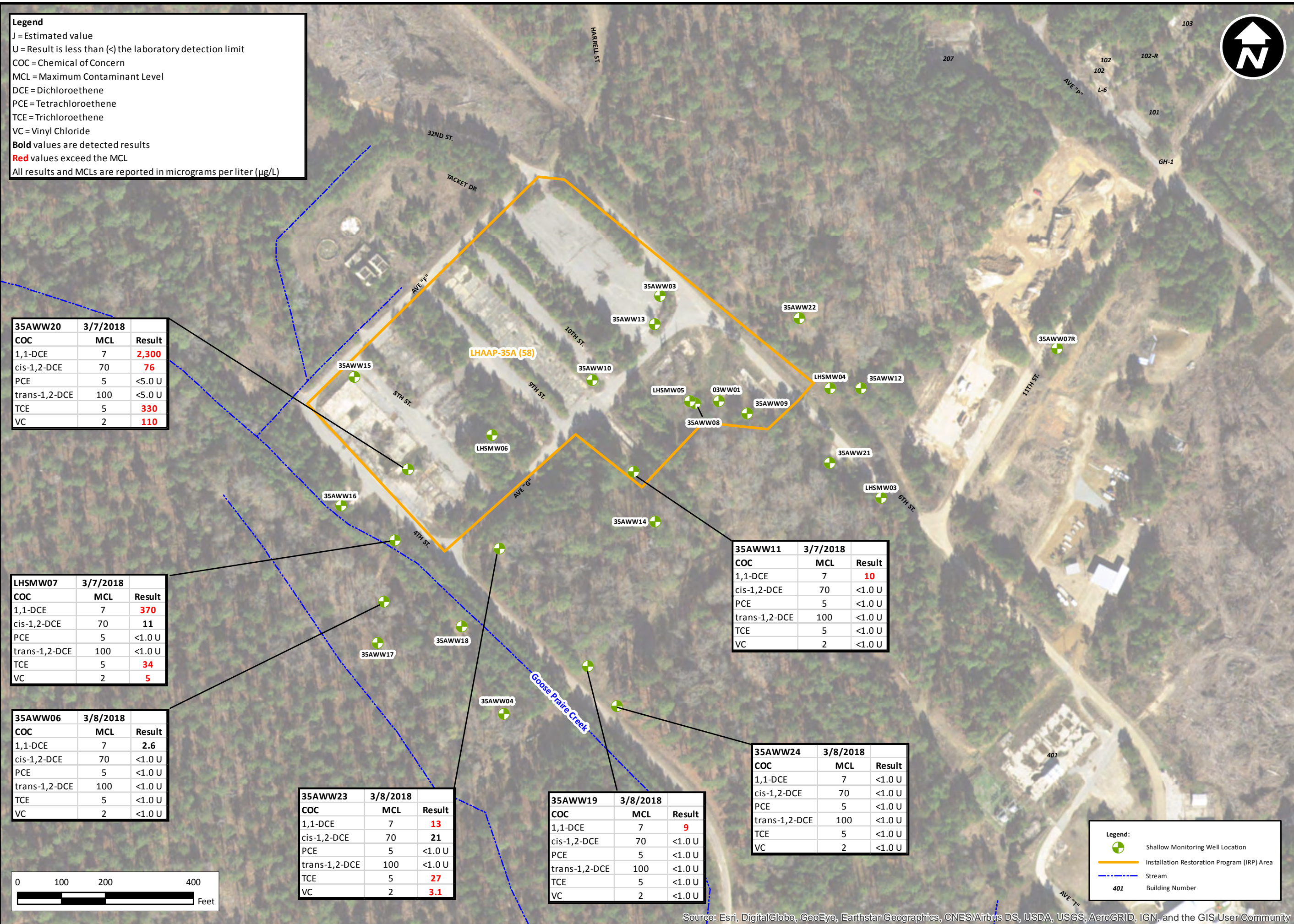
35AWW11	3/7/2018	
COC	MCL	Result
1,1-DCE	7	<b>10</b>
cis-1,2-DCE	70	<1.0 U
PCE	5	<1.0 U
trans-1,2-DCE	100	<1.0 U
TCE	5	<1.0 U
VC	2	<1.0 U

35AWW24	3/8/2018	
COC	MCL	Result
1,1-DCE	7	<1.0 U
cis-1,2-DCE	70	<1.0 U
PCE	5	<1.0 U
trans-1,2-DCE	100	<1.0 U
TCE	5	<1.0 U
VC	2	<1.0 U



**Legend:**

- Shallow Monitoring Well Location
- Installation Restoration Program (IRP) Area
- Stream
- Building Number



**Baseline COC Concentrations in Shallow Groundwater (March 2018)**

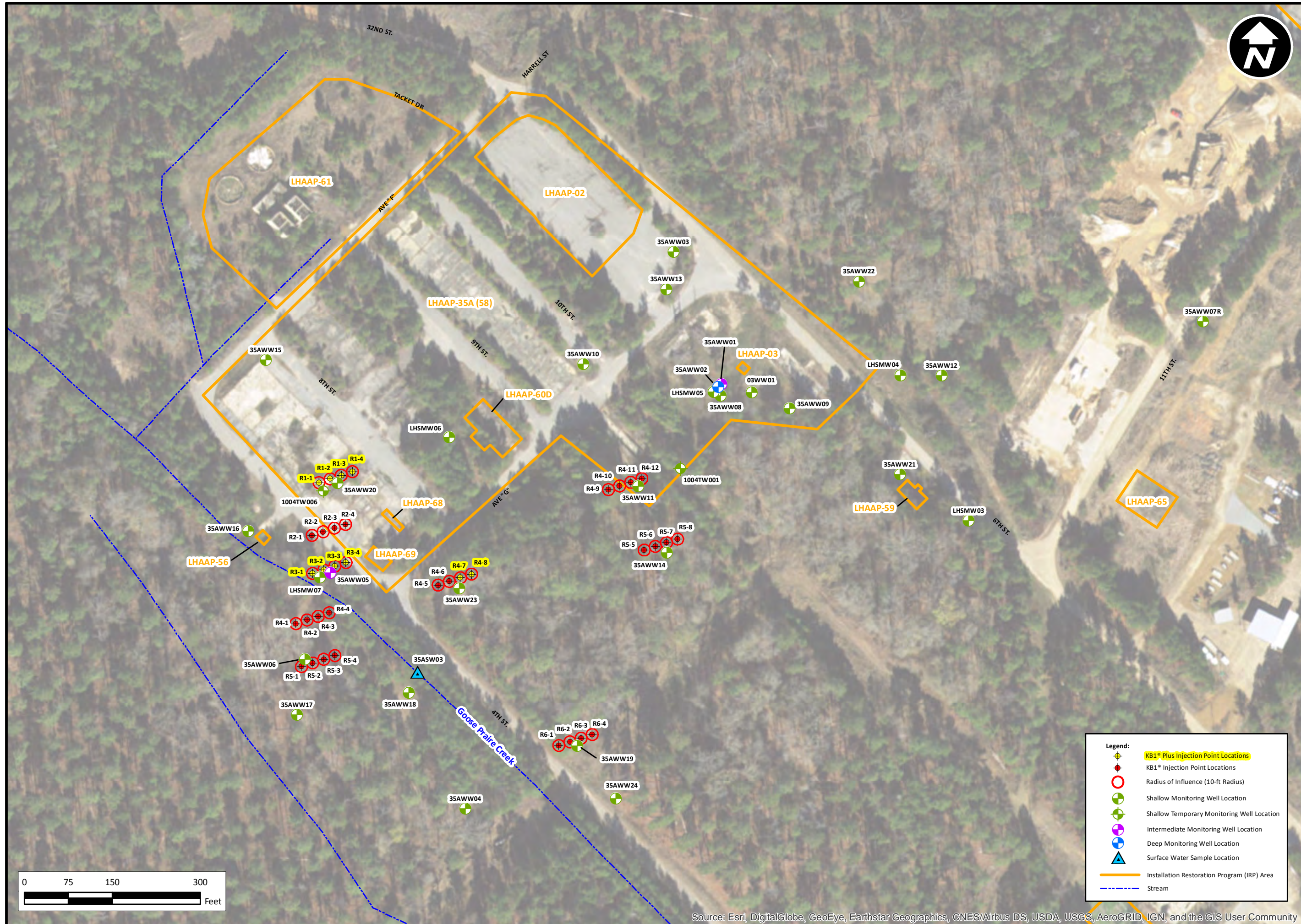
**Figure 2-2**

LHAAP-35A (58) Remedial Action Completion Report  
 Contingency Remedy for Western Plume  
 Longhorn Army Ammunition Plant  
 Karnack, Texas

PROJECT NO: NWO1312.0150. 012.0001.02	SCALE: As Shown	DATE: 5/11/2018	DRAWN BY: MRM
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Legend:**

- KB1® Plus Injection Point Locations
- KB1® Injection Point Locations
- Radius of Influence (10-ft Radius)
- Shallow Monitoring Well Location
- Shallow Temporary Monitoring Well Location
- Intermediate Monitoring Well Location
- Deep Monitoring Well Location
- Surface Water Sample Location
- Installation Restoration Program (IRP) Area
- Stream

Completed Injection Locations  
(March and April 2018)

Figure 2-3

LHAAP-35A (58) Remedial Action Completion Report  
 Contingency Remedy for Western Plume  
 Longhorn Army Ammunition Plant  
 Karnack, Texas

PROJECT NO: NWO1312-0150. 012.0001.02	SCALE: As Shown	DATE: 7/11/2018	DRAWN BY: MRM
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

## **TABLES**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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**Table 2-1**  
**Baseline Groundwater Levels**  
**LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas**  
**RACR Contingency Remedy for Western Plume**

Monitoring Well	Easting	Northing	Aquifer	Date	Screen Intervals (ft from Top of Casing)	TOC Elevation (NAVD 88)	Static Depth to Water (ft BTOC)	Groundwater Elevation (NAVD 88)
35AWW06	3304382.89	6959701.31	Shallow	3/8/2018	19.05 - 29.05	220.43	19.95	200.48
35AWW11	3304950.674	6959996.699	Shallow	3/7/2018	22.24 - 36.84	220.15	31.03	189.12
35AWW19	3304847.027	6959553.806	Shallow	3/7/2018	16.99 - 31.09	219.71	28.87	190.84
35AWW20	3304438.002	6960002.437	Shallow	3/7/2018	20.94 - 35.64	223.05	19.69	203.36
LHSMW07	3304408.12	6959841.17	Shallow	3/7/2018	19.73 - 29.73	221.27	18.97	202.30
35AWW23	3304645.82	6959822.16	Shallow	3/8/2018	25.20 - 40.20	223.07	23.15	199.92
35AWW24	3304912.93	6959464.09	Shallow	3/8/2018	22.10 - 32.10	219.04	26.85	192.19

Notes:

ft - feet

TOC - Top of casing

NAVD - North American Vertical Datum

BTOC - below top of casing

**Table 2-2**  
**Baseline Groundwater Sampling Results**  
**LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas**  
**RACR Contingency Remedy for Western Plume**

Location ID: Sample Date:	Units	MCL/MSC	35AWW06_030818 3/8/18	35AWW06_030818_a 3/8/18	35AWW11-030718 3/7/18	35AWW19_030818 3/8/18	35AWW20-030718 3/7/18	35AWW23_030818 3/8/18	35AWW24_030818 3/8/18	LHSMW07-030718 3/7/18
Location Description			Site 58 - SW, outside the site boundary.	Site 58 - SE, inside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary, between Buildings 716 and 113.	Site 58 -Shallow, new well south of Avenue G in center of Western Plume	Site 58 -Shallow, downgradient new Western Plume well	Site 58 - SW, outside site boundary.	
<b>Alkalinity (310.2/SM2320B)</b>										
Alkalinity, Total	mg/L	NV	666	663	446	159	848	608	66.5	757
<b>Phosphorus (365.3)</b>										
Phosphorus	mg/L	NV	< 0.0250 U	< 0.0250 U	< 0.0250 U	0.129	< 0.0250 U	0.153	0.0240 J	< 0.0250 U
<b>Total Organic Carbon (415.1)</b>										
Total Organic Carbon	mg/L	NV	1.89	2.32	5.28	2.51	14.5	3.31	1.45	6.67
<b>Metals (6020A)</b>										
Total Iron	mg/L	NV	0.249	0.196 J	0.445	1.52	0.660	0.619	0.475	0.417
Total Manganese	mg/L	14	0.236 J	0.226	0.383	0.546	1.34	0.502	0.369	0.119
Dissolved Iron	mg/L	NV	0.0954 J	0.0904 J	0.0143 J	0.304	0.463	< 0.100 U	0.0358 J	0.0325 J
Dissolved Manganese	mg/L	14	0.194	0.187	0.393	0.490	1.55	0.482	0.374	0.137
<b>Volatile Organic Compounds (8260C)</b>										
1,1,1,2-Tetrachloroethane	µg/L	110	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1,1-Trichloroethane	µg/L	200	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2-Trichloroethane	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	64	< 1.0 U	< 1.0 U	3.6
1,1-Dichloroethane	µg/L	10,000	< 1.0 U	< 1.0	< 1.0 U	< 1.0 U	310	8.1	< 1.0 U	51
1,1-Dichloroethene	µg/L	7	2.6	2.6	10	9.0	2,300	13	< 1.0 U	370
1,1-Dichloropropene	µg/L	2.9	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2,3-Trichlorobenzene	µg/L	310	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2,3-Trichloropropane	µg/L	0.041	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2,4-Trichlorobenzene	µg/L	70	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dibromoethane	µg/L	0.05	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichlorobenzene	µg/L	600	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	9.9	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloroethane	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	1.9	14	< 1.0 U	< 1.0 U	2.0
1,2-Dichloropropane	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,3-Dichlorobenzene	µg/L	3,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,3-Dichloropropane	µg/L	29	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,4-Dichlorobenzene	µg/L	75	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2,2-Dichloropropane	µg/L	42	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Butanone	µg/L	61,000	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 10 U	< 2.0 U	< 2.0 U	< 2.0 U
2-Chlorotoluene	µg/L	2,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Hexanone	µg/L	6,100	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 10 U	< 2.0 U	< 2.0 U	< 2.0 U
4-Chlorotoluene	µg/L	2,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Isopropyltoluene	µg/L	10,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Methyl-2-pentanone	µg/L	8,200	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 10 U	< 2.0 U	< 2.0 U	< 2.0 U
Acetone	µg/L	92,000	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 10 U	< 2.0 U	< 2.0 U	< 2.0 U
Benzene	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	5.2	< 1.0 U	< 1.0 U	0.63 J
Bromobenzene	µg/L	2,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromochloromethane	µg/L	4,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromodichloromethane	µg/L	4.6	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U

**Table 2-2**  
**Baseline Groundwater Sampling Results**  
**LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas**  
**RACR Contingency Remedy for Western Plume**

Location ID: Sample Date:	Units	MCL/MSC	35AWW06_030818 3/8/18	35AWW06_030818_a 3/8/18	35AWW11-030718 3/7/18	35AWW19_030818 3/8/18	35AWW20-030718 3/7/18	35AWW23_030818 3/8/18	35AWW24_030818 3/8/18	LHSMW07-030718 3/7/18
Location Description			Site 58 - SW, outside the site boundary.		Site 58 - SE, inside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary, between Buildings 716 and 113.	Site 58 -Shallow, new well south of Avenue G in center of Western Plume	Site 58 -Shallow, downgradient new Western Plume well	Site 58 - SW, outside site boundary.
Bromoform	µg/L	36	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromomethane	µg/L	140	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon disulfide	µg/L	10,000	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 10 U	< 2.0 U	< 2.0 U	< 2.0 U
Carbon tetrachloride	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorobenzene	µg/L	100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chloroethane	µg/L	41,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chloroform	µg/L	1,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chloromethane	µg/L	220	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
cis-1,2-Dichloroethene	µg/L	70	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	<b>76</b>	<b>21</b>	< 1.0 U	<b>11</b>
cis-1,3-Dichloropropene	µg/L	5.3	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Dibromochloromethane	µg/L	34	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Dibromomethane	µg/L	380	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Dichlorodifluoromethane	µg/L	20,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Ethylbenzene	µg/L	700	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Hexachlorobutadiene	µg/L	20	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Isopropylbenzene	µg/L	10,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
m,p-Xylene	µg/L	10,000*	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 10 U	< 2.0 U	< 2.0 U	< 2.0 U
Methylene chloride	µg/L	5	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 10 U	< 2.0 U	< 2.0 U	< 2.0 U
Naphthalene	µg/L	2,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
n-Butylbenzene	µg/L	4,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
n-Propylbenzene	µg/L	4,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
o-Xylene	µg/L	10,000*	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
sec-Butylbenzene	µg/L	4,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Styrene	µg/L	100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
tert-Butylbenzene	µg/L	4,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Tetrachloroethene	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Toluene	µg/L	1,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,2-Dichloroethene	µg/L	100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,3-Dichloropropene	µg/L	29	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Trichloroethene	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	<b>330</b>	<b>27</b>	< 1.0 U	<b>34</b>
Trichlorofluoromethane	µg/L	31,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Vinyl chloride	mg/L	2	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	<b>110</b>	<b>3.1</b>	< 1.0 U	<b>5.0</b>
<b>Volatile Fatty Acids (HPLC-METACIDS)</b>										
Acetic Acid	mg/L	NV	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Butyric Acid	mg/L	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Lactic Acid	mg/L	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Propionic Acid	mg/L	51	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Pyruvic Acid	mg/L	NV	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U

**Table 2-2**  
**Baseline Groundwater Sampling Results**  
**LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas**  
**RACR Contingency Remedy for Western Plume**

Location ID: Sample Date:	Units	MCL/MSC	35AWW06_030818 3/8/18	35AWW06_030818_a 3/8/18	35AWW11-030718 3/7/18	35AWW19_030818 3/8/18	35AWW20-030718 3/7/18	35AWW23_030818 3/8/18	35AWW24_030818 3/8/18	LHSMW07-030718 3/7/18
<b>Location Description</b>			Site 58 - SW, outside the site boundary.	Site 58 - SE, inside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary, between Buildings 716 and 113.	Site 58 -Shallow, new well south of Avenue G in center of Western Plume	Site 58 -Shallow, downgradient new Western Plume well	Site 58 - SW, outside site boundary.	
<b>Anions (9056A)</b>										
Chloride	mg/L	NV	<b>1,000</b>	<b>957</b>	<b>2,530</b>	<b>1,430</b>	<b>1,510</b>	<b>487</b>	<b>119</b>	<b>2,420</b>
Nitrate	mg/L	10	< 0.0500 U	< 0.0500 U	< 0.0500 U	< 0.0500 U	< 0.0500 U	<b>1.20</b>	<b>0.110</b>	< 0.0500 U
Nitrite	mg/L	1	<b>4.12</b>	<b>3.56</b>	<b>14.6</b>	<b>5.58</b>	<b>6.90</b>	<b>2.29</b>	<b>0.213</b>	<b>11.7</b>
Sulfate	mg/L	NV	<b>1,480</b>	<b>1,460</b>	<b>1,260</b>	<b>1,220</b>	<b>1,840</b>	<b>761</b>	<b>85.7</b>	<b>2,700</b>
<b>Dissolved Gases (RSK-175)</b>										
Carbon Dioxide	µg/L	NV	<b>500,000 J</b>	<b>310,000 J</b>	<b>360,000</b>	<b>97,000</b>	<b>370,000</b>	<b>500,000</b>	<b>290,000</b>	<b>350,000</b>
Ethane	µg/L	NV	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U
Ethene	µg/L	NV	< 0.55 U	< 0.55 U	<b>0.38 J</b>	< 0.55 U	< 0.55 U	< 0.55 U	< 0.55 U	< 0.55 U
Methane	µg/L	NV	< 1.0 U	< 1.0 U	<b>16</b>	< 1.0 U	< 1.3 U	< 1.0 U	< 1.0 U	<b>3</b>
<b>Ferrous Iron (SM3500Fe)</b>										
Ferrous Iron	mg/L	NV	<b>0.08 J</b>	<b>0.12 J</b>	<b>0.10 J</b>	<b>1.10 J</b>	<b>0.69 J</b>	<b>0.13 J</b>	<b>0.33 J</b>	<b>0.07 J</b>
<b>Sulfide (376.1)</b>										
Sulfide	mg/L	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
<b>Dechlorinating Bacteria</b>										
BAV1 Vinyl Chloride Reductase	cells/mL	NV	< 0.5 U	< 0.5 U	< 0.5 U	< 1.2 U	< 0.5 U	< 0.5 U	< 2.0 U	< 0.5 U
Dehalobacter spp.	cells/mL	NV	<b>291</b>	<b>218</b>	< 5.0 U	< 11.9 U	<b>1,120</b>	< 4.8 U	<b>79.9</b>	< 4.8 U
Dehalococoides	cells/mL	NV	<b>1.4</b>	<b>1.5</b>	<b>0.6</b>	<b>0.4 J</b>	<b>5.5</b>	< 0.5 U	< 2.0 U	<b>11.8</b>
tceA Reductase	cells/mL	NV	<b>0.1 J</b>	< 0.5 U	< 0.5 U	< 1.2 U	< 0.5 U	< 0.5 U	< 2.0 U	< 0.5 U
Vinyl Chloride Reductase	cells/mL	NV	< 0.5 U	< 0.5 U	< 0.5 U	< 1.2 U	< 0.5 U	< 0.5 U	< 2.0 U	< 0.5 U

## Notes:

Bold values indicate detections

Blue highlighting Indicates concentrations above the MCL/MSC

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentration

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

NV - No Value

\* - value is for total xylenes

**Table 2-3**  
**Injection Volumes by Point**  
**LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas**  
**RACR Contingency Remedy for Western Plume**

Injection point	Depth (20-30 ft bgs) 24 gallons per 1 foot interval				Depth (20-30 ft bgs) 5 gallons per 1 foot interval					
	Date	EVO (gallons)	Water (gallons)	Total (gallons)	Date	EVO (gallons)	Water (gallons)	Total (gallons)	KB-1 (mL)	KB-1+ (mL)
R1-1	3/20/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R1-2	3/20/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R1-3	3/21/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R1-4	3/21/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R2-1	3/21/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R2-2	3/21/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R2-3	3/21/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R2-4	3/21/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R3-1	3/22/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R3-2	3/22/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R3-3	3/22/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R3-4	3/22/2018	40.16	200.8	240.96	4/10/2018	7.5	42.5	50	0	200
R4-1	3/25/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R4-2	3/25/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R4-3	3/25/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R4-4	3/25/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R5-1	3/24/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R5-2	3/24/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R5-3	3/25/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R5-4	3/25/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R4-5	3/22/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R4-6	3/22/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	0
R4-7	3/22/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	430
R4-8	3/22/2018	40.16	200.8	240.96	4/11/2018	7.5	42.5	50	329	400
R4-9	3/24/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R4-10	3/24/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R4-11	3/24/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R4-12	3/24/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R5-5	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R5-6	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R5-7	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R5-8	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R6-1	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R6-2	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	1179	0
R6-3	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0
R6-4	3/23/2018	40.16	200.8	240.96	4/12/2018	7.5	42.5	50	329	0

Notes: KB-1 and KB-1+ were introduced with approximately 25 gallons of remaining injectant left.

ft bgs - feet below ground surface

EVO - Emulsified Vegetable Oil

mL - Milliliters

**APPENDIX A**  
**SURVEY REPORT**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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**Pathfinder Land Surveying, Inc.**  
 505 East Travis Street, Suite #214  
 Marshall, Texas 75670  
 Firm Reg. No.100110-00

Phone: 903.934.9003  
 Fax: 903.472.4303  
[www.pathfindersurveying.com](http://www.pathfindersurveying.com)

April. 17, 2018

BHATE  
 Attn: Kim Nemmers

### **Survey Report**

Datum used: (U.S. Feet)  
 State Plane Coordinate System NAD 83, Texas North Central Zone (4202)  
 Vertical-NAVD 88

35AWW23 (Top of Casing)  
 N=6959822.16  
 E=3304645.82  
 Elevation=223.07

35AWW24 (Top of Casing)  
 N=6959464.09  
 E=3304912.93  
 Elevation=219.04

The above coordinates/elevations were established by setting a GPS base near the site and running Static Sessions for a combined 11 ½ hours, over 3 days, at different times of the day. Those Static Sessions were then sent to OPUS for post processing, and we then averaged the findings determined over those 3 days to establish a base location/elevation. We then ran level loops from the base to the top of the casing on the above 2 wells to establish elevations and tied them with GPS for horizontal location and for a check on the elevations.

There were two reasons for establishing a new GPS base rather than using the monument BG-1. The first was that the coordinates given us for the Monument BG-1 were approximately 4 feet away from where we found the monument, and that monument was found to have been disturbed (appeared to have been hit by a mower or other piece of equipment and moved from it's original location). The second was that the distance from the Monument BG-1 was over 2 miles away from the site of the above two wells.

We did check the elevation (with GPS) of the Monument BG-1 and found it to be only 0.045' different from the given elevation, however, with the 4 foot difference in horizontal location, and the fact that it was not permanently solid (easily moved around), we believed it unwise to use it for control.

We also tied in the concrete pad and natural ground elevations at the above 2 wells, and will provide those elevations if needed.

Feel free to contact me at (903)407-0257 or [brandon@pathfindersurveying.com](mailto:brandon@pathfindersurveying.com) with any questions, etc.

Brandon Clynch, RPLS  
TX 5512, LA 4877

**APPENDIX B**  
**MONITORING WELL INSTALLATION INFORMATION**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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**BORING NUMBER 35AWW23**

**CLIENT** AFCEC **PROJECT NAME** Longhorn Army Ammunition Plant  
**PROJECT NUMBER** NWO1312.0150.012.0001.02 **PROJECT LOCATION** 15600 FM 134 Karnack, Texas 75661  
**DATE STARTED** 2/20/18 **COMPLETED** 2/20/18 **GROUND ELEVATION** \_\_\_\_\_ **HOLE SIZE** 6  
**DRILLING CONTRACTOR** Walker Hill **GROUND WATER LEVELS:**  
**DRILLING METHOD** Geoprobe - Hollow Stem Auger **AT TIME OF DRILLING** ---  
**LOGGED BY** J. Cook **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

BHATE ENVIRONMENTAL ASSOCIATES LONGHORN AAP.GPJ GINT US LAB.GDT 4/17/18

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PID (ppm)
0						
		100	CL-ML		Dark brown silty clay. Moist. 7.5 YR 2.5/2	0.6
4.0						
		100	CL-ML		Light brown silty clay. Clay 7' dense low plasticity. Dry 7.5 YR 4/4	0.2
		100	CL-ML			0.1
8.0						
		100	CL		Dark red/brown clay. Dense low plasticity. Dry. 7.5 YR 2.5/3	0.1
		100	CL			0.3
12.0						
		100	CL		Grey/brown clay. Medium plasticity. Dry. 7.5 YR 3/1	1.5
		100	CL			2.4
16.0						
		100	CL-ML		Dark red/brown silty clay. Dry. 7.5 YR 2/3	5.0
18.0						
		100	CL-ML		Light brown/grey silty clay. Medium plasticity. Dry. 7.5 YR 6/1	5.3
20.0						
		100	CL-ML		Light brown silty clay. Medium plasticity. Dry. 7.5 YR 5/6	0.8
		100	CL-ML			3.2
24.0						
		100	CL		Grey clay. Low plasticity. Dry. 7.5 YR 5/1	2.3
		100	CL			4.1
27.5						
		100	ML		Dark grey silt. Dense low plasticity. Dry. 7.5 YR 3/1	4.1
28.0						
		100	CL-ML		Dark grey dense silty clay. Medium plasticity. Dry. 7.5 YR 3/1	8.7
30						
		100	CL-ML			8.9
		100	CL-ML			5.3
34.0						
			CL-		Light grey silty clay. Medium plasticity. Dry. 7.5 YR 5/1	
35						

(Continued Next Page)






**BORING NUMBER 35AWW23**

CLIENT AFCEC

PROJECT NAME Longhorn Army Ammunition Plant

PROJECT NUMBER NWO1312.0150.012.0001.02

PROJECT LOCATION 15600 FM 134 Karnack, Texas 75661

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PID (ppm)
35		100	ML		Light grey silty clay. (continued)	5.4
		100	CL-ML			2.4
40		100			40.0	2.2
					Bottom of hole at 40.1 feet.	



**BORING NUMBER 35AWW24**

**CLIENT** AFCEC **PROJECT NAME** Longhorn Army Ammunition Plant  
**PROJECT NUMBER** NWO1312.0150.012.0001.02 **PROJECT LOCATION** 15600 FM 134 Karnack, Texas 75661  
**DATE STARTED** 2/20/18 **COMPLETED** 2/20/18 **GROUND ELEVATION** \_\_\_\_\_ **HOLE SIZE** 6  
**DRILLING CONTRACTOR** Walker Hill **GROUND WATER LEVELS:**  
**DRILLING METHOD** Geoprobe - Hollow Stem Auger **AT TIME OF DRILLING** ---  
**LOGGED BY** J. Cook **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

BHATE ENVIRONMENTAL ASSOCIATES LONGHORN AAP.GPJ GINT US LAB.GDT 4/17/18

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PID (ppm)
0						
		100	CL-ML		Dark brown silty clay/ organics. High plasticity. Wet. 7.5 YR 2.5/2	0
					2.0	
		100	CL		Light brown high plasticity clay. High plasticity. Moist. 7.5 YR 4/4	0
					4.0	
5		100	CL		Grey/red brown clay. Medium plasticity. Dry. 7.5 YR 4/1	0
					6.0	
		100	CL-ML		Light grey silty clay. Low plasticity. Dry. 7.5 YR 5/1	0
		100	CL-ML			0
10					10.0	
		100	CL		Light grey/brown silty clay. Dry. 7.5 YR 6/1	0
		100	CL			0
					14.0	
15		100	CL-ML		Light brown silty clay. Medium plasticity. Dry. 7.5 YR 5/6	0
		100	CL-ML			0
		100	CL-ML			0
20					20.0	
		100			Light brown sandy clay. Dry. 7.5 YR 5/6	0
		100	CL-ML		Brown high plasticity silty clay. High plasticity. Moist. 7.5 YR 4/3	0
		100	CL-ML		Light brown silty clay. High plasticity. Wet at 26'. 7.5 YR 4/4	0
25					24.0	
		100	CL-ML		Light grey/brown silty clay. High plasticity. Wet. 7.5 YR 5/1	0
		100	CL-ML			0
30						
		100	CL-ML			0
					32.0	
					Bottom of hole at 32.1 feet.	

## MONITORING WELL DEVELOPMENT FORM

LOCATION	Site: 58	LocID: 35AWW24	Date: 2/26/18								
	Project Name: Longhorn Army Ammunition Plant	Project #: NW01312.0150	Recorded By: Bessinger Checked By:								
EQUIPMENT	Water Quality Meter Type/ID #: U-52 HORIBA	Water Level Indicator Type/ID #: Solinist 101									
	Equipment Group: NA	Equipment Group: NA									
	Development Equipment: SURGE BLOCK & MONSOON PUMP	Equipment Decon.: LIQUINOX & DI WATER									
WELL INFO	Casing I.D. (in) [a]: 2"	Unit Casing Volume (gal/in ft) [b]: 7.89	Initial Depth to Water (ft) [c]: 27.11								
	Total Well Depth (ft) [d]: 35.00	Water Column Thickness (ft) [d-c]:	Well Volume (gal) {[d-c] x b): 1.24								
	Ground Condition of Well:	Remarks:									
	CASING INFO	Casing I.D. (in) [a]:	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0
	Unit Casing Volume (gal/in ft) [b]:	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

Date	Time (24 hr)	Method (pump, surge, bail)	Water Level (FTOC)	Volume Removed (gal)	Pumping Rate (gpm)	Temp. (C)	pH	Conductivity (mS/cm)	DO (mg/L)	Turb. (NTU)	ORP (mv)	Radiation ( )	Remarks (odor, clarity, etc.)
2/26/18	1400	Pump	31.60	5	.5	22.28	7.53	0.511	11.53	1000+	184		
2/26/18	1415	Pump	32.60	7.5	.5	23.70	7.02	0.408	10.58	1000+	191		
2/26/18	1430	Pump	33.77	7.5	.5	23.51	6.91	0.395	10.46	1000+	199		
2/27/18	0830	Pump	31.70	7.5	.5	16.28	6.85	0.524	10.12	1000+	224		
2/27/18	0840	Pump	32.50	5	.5	18.30	6.80	0.577	10.05	777	229		
2/27/18	0850	Pump	33.00	5	.5	18.80	6.72	0.585	10.00	403	230		
2/27/18	0900	Pump	33.71	5	.5	18.98	6.70	0.600	9.85	200	235		
2/27/18	0905	Pump	34.45	5	.5	19.05	6.65	0.608	9.80	107	239		
2/27/18	1330	Pump	27.12	5	.5	19.31	6.61	0.612	9.71	66.7	243		
2/27/18	1340	Pump	29.15	5	.5	19.40	6.57	0.617	9.65	29.3	248		
2/27/18	1350	Pump	30.40	5	.5	19.50	6.55	0.620	9.60	12.1	251		
2/27/18	1400	Pump	30.89	5	.5	19.61	6.52	0.623	9.54	8.6	253		

Development Criteria:

- 1) sediment <0.75 mL/L, 2) turbidity within 10 NTU range for 30 minutes, 3) +/- 0.5 C, +/- 0.1 pH, +/- 3 % conductivity, +/- 10% DO for 3 consecutive readings, AND
- 4) remove water added during drilling and construction

## MONITORING WELL DEVELOPMENT FORM

LOCATION	Site: 58	LocID: 35AWW23	Date: 2/27/18								
	Project Name: Longhorn Army Ammunition Plant	Project #: NWO 1312.0150	Recorded By: Buesinger Checked By:								
EQUIPMENT	Water Quality Meter Type/ID #: U-52 HORIBA	Water Level Indicator Type/ID #: Solinst 101									
	Equipment Group: NA	Equipment Group: NA									
	Development Equipment: SURGE Block 3 monsoon Pump	Equipment Decon.: Liquinox 3 DI WATER									
WELL INFO	Casing I.D. (in) [a]:	Unit Casing Volume (gal/lin ft) [b]: 20.45	Initial Depth to Water (ft) [c]: 23.26								
	Total Well Depth (ft) [d]: 43.71	Water Column Thickness (ft) [d-c]:	Well Volume (gal) [(d-c) x b]: 3.27								
	Ground Condition of Well:	Remarks:									
	CASING INFO	Casing I.D. (in) [a]:	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0
Unit Casing Volume (gal/lin ft) [b]:	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6	

Date	Time (24 hr)	Method (pump, surge, bail)	Water Level (FTOC)	Volume Removed (gal)	Pumping Rate (gpm)	Temp. (C)	pH	Conductivity (mS/cm)	DO (mg/L)	Turb. (NTU)	ORP (mv)	Radiation ( )	Remarks (odor, clarity, etc.)
2/27/18	1025	Pump	30.55	5	.5	19.81	7.28	4.72	10.31	1000+	199		
2/27/18	1035	Pump	34.05	5	.5	20.28	7.62	4.24	10.12	1000+	192		
2/27/18	1045	Pump	38.25	5	.5	19.91	7.76	5.46	10.05	1000+	196		
2/27/18	1055	Pump	39.00	5	.5	20.21	7.70	5.55	9.87	603	199		
2/27/18	1105	Pump	42.30	5	.5	20.35	7.69	5.61	9.71	381	202		
2/27/18	1215	Pump	36.11	5	.5	20.40	7.65	5.70	9.65	177	207		
2/27/18	1225	Pump	36.92	5	.5	20.55	7.70	5.73	9.60	83.1	209		
2/27/18	1235	Pump	37.51	5	.5	20.71	7.72	5.80	9.47	44.5	212		
2/27/18	1245	Pump	37.90	5	.5	20.79	7.69	5.83	9.40	18.1	215		
2/27/18	1255	Pump	38.12	5	.5	20.83	7.61	5.87	9.31	10.2	217		
2/27/18	1305	Pump	38.40	5	.5	20.77	7.59	5.90	9.25	9.6	218		
2/27/18	1315	Pump	38.63	5	.5	20.80	7.57	5.95	9.20	8.5	219		

## Development Criteria:

- 1) sediment <0.75 mL/L, 2) turbidity within 10 NTU range for 30 minutes, 3) +/- 0.5 C, +/- 0.1 pH, +/- 3 % conductivity, +/- 10% DO for 3 consecutive readings, AND
- 4) remove water added during drilling and construction

## STATE OF TEXAS WELL REPORT for Tracking #472957

Owner: <b>USACE</b>	Owner Well #: <b>35AWW23</b>
Address: <b>1645 S. 101st. East Ave. Tulsa, OK 74128</b>	Grid #: <b>35-23-6</b>
Well Location: <b>15600 FM 134 Karnack, TX 75661</b>	Latitude: <b>32° 41' 06.21" N</b>
Well County: <b>Harrison</b>	Longitude: <b>094° 09' 20.84" W</b>
	Elevation: <b>No Data</b>
Type of Work: <b>New Well</b>	
	Proposed Use: <b>Monitor</b>

Drilling Start Date: **2/19/2018**      Drilling End Date: **2/23/2018**

	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
Borehole:	<b>8</b>	<b>0</b>	<b>40</b>

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
Filter Pack Intervals:	<b>23</b>	<b>40</b>	<b>Sand</b>	<b>20/40</b>

	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
Annular Seal Data:	<b>0</b>	<b>20</b>	<b>Cement 7 Bags/Sacks</b>
	<b>20</b>	<b>23</b>	<b>Bentonite 2 Bags/Sacks</b>

Seal Method: **Tremie**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **No Data**

Water Level: **23.6 ft. below land surface on 2018-02-23**      Measurement Method: **Electric Line**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
	<b>No Data</b>	<b>No Data</b>

Chemical Analysis Made: **No**Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

**The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Walker-Hill Environmental, Inc.**

**PO 1147  
Foxworth, MS 39483**

Driller Name: **Gary P Hill** License Number: **58141**Apprentice Name: **Eric Meitzler**Comments: **No Data**

Lithology:  
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:  
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
<b>0</b>	<b>8</b>	<b>CL-ML, Dark Brown, Silty Clay</b>
<b>8</b>	<b>14</b>	<b>CL, Dark Red/Brown, Clay</b>
<b>14</b>	<b>16</b>	<b>CL, Grey/Brown, Clay</b>
<b>16</b>	<b>22</b>	<b>CL-ML, Light Brown/Grey, Silty Clay</b>
<b>22</b>	<b>24</b>	<b>CL-ML, Light Brown, Silty Clay</b>
<b>24</b>	<b>27</b>	<b>CL, Grey, CLay</b>
<b>27</b>	<b>30</b>	<b>ML, Dark Grey, Silt</b>
<b>30</b>	<b>36</b>	<b>CL-ML, Dark Grey, Dense silty Clay</b>
<b>36</b>	<b>38</b>	<b>CL-ML, Light Grey, Silty Clay</b>
<b>38</b>	<b>40</b>	<b>CL-ML, Light Grey Silty CLay</b>

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
<b>2</b>	<b>Riser</b>	<b>New Plastic (PVC)</b>	<b>40</b>	<b>0</b>	<b>25</b>
<b>2</b>	<b>Screen</b>	<b>New Plastic (PVC)</b>	<b>40 0.010</b>	<b>25</b>	<b>40</b>

---

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation**  
**P.O. Box 12157**  
**Austin, TX 78711**  
**(512) 334-5540**

## STATE OF TEXAS WELL REPORT for Tracking #472959

Owner: <b>USACE</b>	Owner Well #: <b>35AWW24</b>
Address: <b>1645 S. 101st. East Ave. Tulsa, OK 74128</b>	Grid #: <b>35-23-6</b>
Well Location: <b>15600 FM 134 Karnack, TX 75661</b>	Latitude: <b>32° 41' 02.9" N</b>
Well County: <b>Harrison</b>	Longitude: <b>094° 09' 18.16" W</b>
	Elevation: <b>No Data</b>
Type of Work: <b>New Well</b>	
	Proposed Use: <b>Monitor</b>

Drilling Start Date: **2/19/2018**      Drilling End Date: **2/23/2018**

	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
Borehole:	<b>8</b>	<b>0</b>	<b>32</b>

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
Filter Pack Intervals:	<b>20</b>	<b>32</b>	<b>Sand</b>	<b>20/40</b>

	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
Annular Seal Data:	<b>0</b>	<b>15</b>	<b>Cement 5 Bags/Sacks</b>
	<b>15</b>	<b>20</b>	<b>Bentonite 0 Bags/Sacks</b>

Seal Method: **Tremie**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

**Surface Completion by Driller**

Water Level: <b>26.98 ft. below land surface on 2018-02-23</b>	Measurement Method: <b>Electric Line</b>
Packers: <b>No Data</b>	
Type of Pump: <b>No Data</b>	
Well Tests: <b>No Test Data Specified</b>	

Water Quality:	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
	<b>No Data</b>	<b>No Data</b>

Chemical Analysis Made: **No**Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

**The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Walker-Hill Environmental, Inc.**

**PO 1147  
Foxworth, MS 39483**

Driller Name: **Gary P Hill** License Number: **58141**Apprentice Name: **Eric Meitzler**Comments: **No Data**

Lithology:  
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:  
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	2	CL-ML, Dark Brown, Silty Clay
2	4	CL, Light brown, high plasticity clay
4	8	CL grey,reddish brown, Clay
8	12	CL-ML, Light grey, silty clay
12	18	CL-ML, Light grey/brown, silty clay
18	20	CL-ML, Light Brown, Silty Clay
20	22	CLS, Light Brown, Sandy Clay
22	24	CL-ML, Brown, High plasticity, Silty clay
24	28	CL-ML, Light Brown, silty clay
28	32	CL-ML, Light Grey/Brown, Silty Clay

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
2	Riser	New Plastic (PVC)	40	0	22
2	Screen	New Plastic (PVC)	40 0.010	22	32

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**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation**  
**P.O. Box 12157**  
**Austin, TX 78711**  
**(512) 334-5540**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

**APPENDIX C**  
**GROUNDWATER SAMPLE COLLECTION FORMS**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: 35AWW11	Date: 3/7/18								
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger								
<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba / 21354	PID Type/ID#: NA								
	Water Level Indicator Type/ID#: Solinst 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water								
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D								
<b>WELL INFO</b>	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.16	Initial Depth to Water (ft) (B): 31.17								
	Total Well Depth (ft) (C): 38.08	Water Column Thickness (ft) (C-B): 6.91	Well Volume (gal) (A*(C-B)): 1.11								
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): <del>NA</del>								
	Weather: CLEAR COLD	Well Condition: GOOD	Comments: NA								
<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57
<b>DATE</b>	<b>TIME (24 Hr)</b>	<b>Water Level (BTOC)</b>	<b>Volume Removed (Gals)</b>	<b>Pumping Rate (ml/min)</b>	<b>Temp (C)</b>	<b>pH</b>	<b>Cond (mS/cm)</b>	<b>DO (mg/l)</b>	<b>Turb (NTU)</b>	<b>ORP (mV)</b>	<b>Remarks (odor, clarity, etc.)</b>
3/7/18	1155	31.24	.13	100	17.21	6.16	9.58	1.43	220	196	
	1200	31.30	.26	100	17.89	5.91	9.64	1.01	207	210	
	1205	31.34	.39	100	18.25	5.92	9.60	0.89	116	213	
	1210	31.37	.52	100	18.28	5.93	9.50	0.61	92.0	212	
	1215	31.39	.65	100	18.32	5.93	9.50	0.60	91.7	211	
	1220	31.40	.78	100	18.35	5.94	9.49	0.60	91.3	211	
	1225	31.41	.91	100	18.37	5.94	9.49	0.59	90.8	211	
<b>Colorimeter Results</b>					<b>No. Containers/Volume/Type</b>			<b>Preserv.</b>	<b>Filter (Y/N)</b>	<b>Method</b>	<b>Parameter(s)</b>
<b>Time</b>	<b>Analyte</b>	<b>Dilution</b>	<b>Result</b>	<b>Units</b>	+ 125 ml Perc						
					250 ml Phosphorus			H2SO4		365.3	
					250 ml Ferrous			HCL		5m 3500	
					250 ml Ammonia / NH3			-		9056A / 2320B	
<b>Conversions</b>	<b>Stabilization Criteria</b>				40 ml VOA			H2SO4		415.1	
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%	40 ml VOA			HCL		8260	
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%	40 ml			-		Organic Acids	
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW11-030718					Sample Time: 1225	

40 ml Dissolved gases HCL RSK-175  
 500ml Sulfide NaOH/Zn/Ac 376.1  
 60ml Metals HNO3 660  
 1L DHB/DHC - CEN/SUS



GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: LHSMW07	Date: 3/7/18								
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger								
<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba / 21354	PID Type/ID#: NA								
	Water Level Indicator Type/ID#: Solinst 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water								
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D								
<b>WELL INFO</b>	Casing Type / ID (in): 4" PVC	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 19.13								
	Total Well Depth (ft) (C): 30.46	Water Column Thickness (ft) (C-B): 11.33	Well Volume (gal) (A*(C-B)): 7.39								
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal):								
	Weather: CLEAR / COLD	Well Condition: GOOD	Comments: NA								
<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57
<b>DATE</b>	<b>TIME (24 Hr)</b>	<b>Water Level (BTOC)</b>	<b>Volume Removed (Gals)</b>	<b>Pumping Rate (ml/min)</b>	<b>Temp (C)</b>	<b>pH</b>	<b>Cond (mS/cm)</b>	<b>DO (mg/l)</b>	<b>Turb (NTU)</b>	<b>ORP (mV)</b>	<b>Remarks (odor, clarity, etc.)</b>
3/7/18	1040	19.20	.13	100	17.08	7.16	11.1	1.77	20.1	139	
	1045	19.25	.26	100	18.44	6.38	11.8	1.12	8.6	156	
	1050	19.30	.39	100	17.98	6.16	12.4	0.91	7.3	174	
	1055	19.32	.52	100	18.12	6.11	12.2	0.67	7.0	179	
	1100	19.34	.65	100	18.19	6.10	12.1	0.66	6.5	179	
	1105	19.35	.78	100	18.23	6.10	12.1	0.66	5.8	180	
	1110	19.35	.91	100	18.28	6.10	12.1	0.65	5.1	180	
<b>Colorimeter Results</b>					<b>No. Containers/Volume/Type</b>			<b>Preserv.</b>	<b>Filter (Y/N)</b>	<b>Method</b>	<b>Parameter(s)</b>
<b>Time</b>	<b>Analyte</b>	<b>Dilution</b>	<b>Result</b>	<b>Units</b>	<del>125 ml</del> <del>Perc</del>						
					250 ml Phos			H <sub>2</sub> SO <sub>4</sub>			
					250 ml Ferris			HCL			
					250 ml Amms/Alk			-			
<b>Conversions</b>	<b>Stabilization Criteria</b>				40 ml VOA			TDC	H <sub>2</sub> SO <sub>4</sub>		
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%	40 ml VOA			VOCs	HCL		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%	40 ml			VFA's	-		
	Cond	+/- 10%	ORP	+/- 10	Sample ID: LHSMW07-030718					Sample Time: 1110	

40ml Diss Gases  
 500ml Sulfide  
 600ml Metals  
 1 L DHB 10HC  
 HCL  
 NWOH/ZnAc  
 HNO<sub>3</sub>



GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>		Site: LHAAP - 58		Location ID: 35FAWW20				Date: 3/7/18				
		Project Name: LHAAP		Project No./Phase: NWO1312.0150				Recorded By: Scott Beesinger				
<b>EQUIPMENT</b>		Pump Type/ID#: Bladder Pump / SamplePro		Water Quality Meter/ID#: U-52 Horiba / 21354				PID Type/ID#: NA				
		Water Level Indicator Type/ID#: Sofinist 101		Other Equipment/ID#: NA				Decon Method: Liquinox & DI water				
		Tubing Type/Diameter (in): 1/4"		Other Equipment/ID#: NA				PPE: Level D				
<b>WELL INFO</b>		Casing Type / ID (in): 2"		Unit Casing Volume (gal/in ft) (A): 0.16				Initial Depth to Water (ft) (B): 20.15				
		Total Well Depth (ft) (C): 36.20		Water Column Thickness (ft) (C-B): 16.05				Well Volume (gal) (A*(C-B)): 2.57				
		Ambient PID (ppm): NA		Well Mouth PID (ppm): NA				System Volume (gal):				
		Weather: CLEAR COLD		Well Condition:				Comments: NA				
<b>CASING INFO</b>		Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
		Unit Casing Volume (gal/in ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57
DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)	
3/7/18	0930	20.22	.13	100	17.58	6.60	8.54	1.63	86.4	105		
	0935	20.27	.26	100	18.86	6.37	8.24	1.13	62.3	98		
	0940	20.31	.39	100	19.42	6.21	8.10	0.88	49.3	100		
	0945	20.33	.52	100	19.40	6.18	7.98	0.63	23.0	104		
	0950	20.34	.65	100	19.37	6.17	7.98	0.61	22.5	105		
	0955	20.35	.78	100	19.35	6.17	7.97	0.60	21.9	105		
	1000	20.35	.84	100	19.32	6.16	7.97	0.60	21.3	106		
<b>Colorimeter Results</b>				<b>No. Containers/Volume/Type</b>				<b>Preserv.</b>	<b>Filter (Y/N)</b>	<b>Method</b>	<b>Parameter(s)</b>	
Time	Analyte	Dilution	Result	Units								
					125 ml	PERC						
					250	PHOS	H <sub>2</sub> SO <sub>4</sub>					
					250	TRAINS FE	HCL					
					250	AMMONIUM / AM						
<b>Conversions</b>				<b>Stabilization Criteria</b>								
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%	40 ml VOA	TDC	H <sub>2</sub> SO <sub>4</sub>					
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%	40 ml VOA	VOCs	HCL					
	Cond	+/- 10%	ORP	+/- 10	40 ml	VFA's						
Sample ID: 35FAWW20_030718						Sample Time: 1000						

40 ml Diss Gases HCL  
 50 ml sulfide NaOH / ZnAc  
 60 ml Metals #RAD3  
 1 L D+BI/DHC



GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>		Site: LHAAP - 58		Location ID: 35AWW19		Date: 3/7/18						
		Project Name: LHAAP		Project No./Phase: NWO1312.0150		Recorded By: Scott Beesinger						
<b>EQUIPMENT</b>		Pump Type/ID#: Bladder Pump / SamplePro		Water Quality Meter/ID#: U-52 Horiba / 21354		PID Type/ID#: NA						
		Water Level Indicator Type/ID#: Solinist 101		Other Equipment/ID#: NA		Decon Method: Liquinox & DI water						
		Tubing Type/Diameter (in): 1/4"		Other Equipment/ID#: NA		PPE: Level D						
<b>WELL INFO</b>		Casing Type / ID (in): PVC 2"		Unit Casing Volume (gal/in ft) (A): 0.16		Initial Depth to Water (ft) (B): 27.81						
		Total Well Depth (ft) (C): 32.53		Water Column Thickness (ft) (C-B): 4.72		Well Volume (gal) (A*(C-B)): 0.76						
		Ambient PID (ppm): NA		Well Mouth PID (ppm): NA		System Volume (gal):						
		Weather: CLEAR / COOL		Well Condition: GOOD		Comments: NA						
<b>CASING INFO</b>		Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
		Unit Casing Volume (gal/in ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57
DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)	
3/7/18	1255	27.81	NA	NA							BAILING WELL	
3/7/18	1300	32.39	2.25	NA							WELL RAN DRY	
3/8/18	0815	27.81	NA	NA	16.76	5.28	10.08	NA	26.4	NA		
<b>Colorimeter Results</b>				<b>No. Containers/Volume/Type</b>				<b>Preserv.</b>	<b>Filter (Y/N)</b>	<b>Method</b>	<b>Parameter(s)</b>	
<b>Time</b>	<b>Analyte</b>	<b>Dilution</b>	<b>Result</b>	<b>Units</b>	250 ml	Phos	H <sub>2</sub> SO <sub>4</sub>					
					250 "	Fe/Mn/Fe	HCl					
					250 "	Anions/Alk	-					
					40ml VOA	TDC	H <sub>2</sub> SO <sub>4</sub>					
					40ml VOA	VOC	HCl					
					40ml	VFA's	-					
					46ml	Diss Gases	HCl					
<b>Conversions</b>	<b>Stabilization Criteria</b>				<b>Sample ID:</b> 35AWW19-030818		<b>Sample Time:</b> 0815					
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%								
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%								
	Cond	+/- 10%	ORP	+/- 10								

500ml Sulfide NiOH/ZnAc  
 60ml Metals HNO<sub>3</sub>  
 1L DTH/alc -



GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: 35A WW06	Date: 3/8/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger

<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba / 21354	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinst 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D

<b>WELL INFO</b>	Casing Type / ID (in): 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 20.05
	Total Well Depth (ft) (C): 30.36	Water Column Thickness (ft) (C-B): 10.31	Well Volume (gal) (A*(C-B)): 6.72
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: CLEAR / COLD	Well Condition: GOOD	Comments: NA

<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/8/18 ↓ ↓	0900	20.11	.13	100	14.50	6.11	6.25	1.33	20.4	132	
	0905	20.15	.26	100	15.84	5.87	6.05	0.87	15.2	122	
	0910	20.20	.59	100	17.29	5.70	6.02	0.41	8.7	130	
	0915	20.22	.52	100	17.75	5.69	5.92	0.28	6.3	135	
	0920	20.23	.65	100	17.83	5.68	5.91	0.27	5.5	135	
	0925	20.24	.78	100	17.87	5.67	5.91	0.26	4.9	136	
	0930	20.25	.91	100	17.91	5.67	5.91	0.26	4.4	136	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units							
					250	Total Phos	H2SO4				
					250	Ferrus Fe	HCL				
					250	Ammon / NH	-				
					40 ml VOA	TDC	H2SO4				
					40 ml VOA	VOC	HCL				
					40 ml	VFA's	-				
					40 ml	Diss Gases	HCL				
<b>Conversions</b>					Sample ID: 35A WW06-0308/8		Sample Time: 0930				
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%							
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%							
	Cond	+/- 10%	ORP	+/- 10							

500 ml  
60 ml  
1L

Silfide  
Metals  
DHA/DHC

NaOH/ZnAc  
HNO3  
-



GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: 35AWW23	Date: 3/8/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger

<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba / 21354	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinst 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D

<b>WELL INFO</b>	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.16	Initial Depth to Water (ft) (B): 23.15
	Total Well Depth (ft) (C): 43.71	Water Column Thickness (ft) (C-B): 20.56	Well Volume (gal) (A*(C-B)): 3.29
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: CLEAR   cool	Well Condition: GOOD	Comments: NA

<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/8/18 ↓ ↓ ↓ ↓ ↓ ↓	1030	23.20	.13	100	18.10	6.39	3.65	1.35	102	139	
	1035	23.25	.26	100	18.35	5.92	3.64	1.00	105	168	
	1040	23.30	.39	100	18.48	5.87	3.61	0.85	95.3	180	
	1045	23.33	.52	100	18.52	5.90	3.59	0.78	91.5	183	
	1050	23.35	.65	100	18.57	5.91	3.58	0.77	90.3	184	
	1055	23.36	.78	100	18.60	5.92	3.58	0.77	89.9	185	
	1100	23.37	.91	100	18.63	5.92	3.58	0.76	89.5	185	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units							
					250 ml	Phos	H <sub>2</sub> SO <sub>4</sub>				
					250	Ferrus	HCL				
					250	Ammon / AIK	-				
					40 ml VOA	TDC	H <sub>2</sub> SO <sub>4</sub>				
					40 ml VOA	VOC	HCL				
					40 ml	VFA's	-				
					40 ml	Disinfectants	HCL				
<b>Conversions</b>					<b>Stabilization Criteria</b>						
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%							
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%							
	Cond	+/- 10%	ORP	+/- 10							
					Sample ID: 35AWW23-030818			Sample Time: 1100			

500 ml Silica  
60 ml Metals  
1L DHB/DAC

NODK/ENAC  
HNO<sub>3</sub>  
-



GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: 35AWW24	Date: 3/8/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba / 21354	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinst 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
<b>WELL INFO</b>	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.16	Initial Depth to Water (ft) (B): 26.85
	Total Well Depth (ft) (C): 35.00	Water Column Thickness (ft) (C-B): 8.15	Well Volume (gal) (A*(C-B)): 1.30
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: CLEAR / COOL	Well Condition: GOOD	Comments: NA

<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/8/18 ↓ ↓ ↓ ↓ ↓ ↓	1140	26.81	.13	100	18.34	5.96	0.549	1.44	203	180	
	1145	26.96	.26	100	19.37	5.39	0.491	0.93	154	217	
	1150	27.01	.39	100	19.52	5.31	0.490	0.75	115	225	
	1155	27.05	.52	100	19.67	5.31	0.488	0.67	101	225	
	1200	27.08	.65	100	19.75	5.31	0.487	0.67	100	225	
	1205	27.10	.78	100	19.80	5.31	0.487	0.66	100	224	
	1210	27.12	.91	100	19.84	5.31	0.487	0.66	99.5	224	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units							
					250ul	Plus	H <sub>2</sub> SO <sub>4</sub>				
					250	Fe/mn	HCl				
					250	Anions / Ar K	-				
					40 ml VFA	TDC	H <sub>2</sub> SO <sub>4</sub>				
					40 ml VFA	VOC	HCl				
					40 ml	VFA's	-				
					40 ml	Disinfectants	HCl				
<b>Conversions</b>	<b>Stabilization Criteria</b>				Sample ID:	35AWW24-030818		Sample Time:	1210		
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%							
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%							
	Cond	+/- 10%	ORP	+/- 10							

500ml  
 40 ml  
 1L

Sulfide  
 Metals  
 BIOLOGIC

NaOH / Zn Ac  
 HNO<sub>3</sub>  
 -

**APPENDIX D**  
**BASELINE GROUNDWATER SAMPLING ANALYTICAL RESULTS**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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10450 Stancliff Rd. Suite 210  
Houston, TX 77099  
T: +1 281 530 5656  
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March 30, 2018

Marcia Olive  
Bhate Environmental Associates, Inc.  
445 Union Blvd Ste 129  
Lakewood, CO 80228

Work Order: **HS18030365**

Laboratory Results for: **LHAAP-58**

Dear Marcia,

ALS Environmental received 4 sample(s) on Mar 08, 2018 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DAYNA.FISHER  
RJ Modashia  
Project Manager

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**Work Order:** HS18030365

**SAMPLE SUMMARY**

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18030365-01	35AWW20-030718	Groundwater		07-Mar-2018 10:00	08-Mar-2018 09:30	<input type="checkbox"/>
HS18030365-02	LHSMW07-030718	Groundwater		07-Mar-2018 11:10	08-Mar-2018 09:30	<input type="checkbox"/>
HS18030365-03	35AWW11-030718	Groundwater		07-Mar-2018 12:25	08-Mar-2018 09:30	<input type="checkbox"/>
HS18030365-04	Trip Blank	Water	ALS-021518-87	07-Mar-2018 00:01	08-Mar-2018 09:30	<input type="checkbox"/>

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**Work Order:** HS18030365

**CASE NARRATIVE****Work Order Comments**

- The analyses for RSK-175 Dissolved Gases and CO2 were subcontracted to ALS Environmental in Simi Valley, CA. Final Report attached.
- The analyses for Ferrous Iron and Volatile Fatty Acids were subcontracted to ALS Environmental in Rochester, NY. Final Report attached.
- The analyses for DHC/DHB were subcontracted to Microbial Insights in Knoxville, TN. Final Report attached.

**GCMS Volatiles by Method SW8260****Batch ID: R312577****Sample ID: HS18030510-01MS**

- MS and MSD are for an unrelated sample

**Metals by Method SW6020****Batch ID: 126134****Sample ID: 35AWW20-030718 (HS18030365-01MS)**

- The MS and/or MSD recovery was outside of the control; however, the result in the parent sample is greater than 4x the spike amount. Manganese.

**Batch ID: 126131****Sample ID: HS18030472-02MSD**

- MSD is for an unrelated sample

**WetChemistry by Method E415.1****Batch ID: R312878**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**WetChemistry by Method SW9056****Batch ID: R312306**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**WetChemistry by Method E376.1****Batch ID: R312697**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**WetChemistry by Method SM2320B****Batch ID: R312233**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**WetChemistry by Method E365.3****Batch ID: 126467**

**ALS Group Houston, Corp**

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.**CASE NARRATIVE****Project:** LHAAP-58**Work Order:** HS18030365

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**WetChemistry by Method E365.3****Batch ID: 126467**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.
-

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW20-030718  
 Collection Date: 07-Mar-2018 10:00

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-01  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						
								Analyst: AKP
1,1,1,2-Tetrachloroethane	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,1,1-Trichloroethane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,1,2,2-Tetrachloroethane	2.5	U	2.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
<b>1,1,2-Trichloroethane</b>	<b>64</b>		<b>1.5</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56
<b>1,1-Dichloroethane</b>	<b>310</b>		<b>1.0</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56
<b>1,1-Dichloroethene</b>	<b>2,300</b>		<b>10</b>	<b>25</b>	<b>50</b>	<b>ug/L</b>	50	15-Mar-2018 17:23
1,1-Dichloropropene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,2,3-Trichlorobenzene	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,2,3-Trichloropropane	2.5	U	2.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,2,4-Trichlorobenzene	2.5	U	2.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,2,4-Trimethylbenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,2-Dibromo-3-chloropropane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,2-Dibromoethane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
<b>1,2-Dichlorobenzene</b>	<b>9.9</b>		<b>2.5</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56
<b>1,2-Dichloroethane</b>	<b>14</b>		<b>1.0</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56
1,2-Dichloropropane	2.5	U	2.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,3,5-Trimethylbenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,3-Dichlorobenzene	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,3-Dichloropropane	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
1,4-Dichlorobenzene	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
2,2-Dichloropropane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
2-Butanone	5.0	U	2.5	5.0	10	ug/L	5	15-Mar-2018 16:56
2-Chlorotoluene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
2-Hexanone	5.0	U	5.0	5.0	10	ug/L	5	15-Mar-2018 16:56
4-Chlorotoluene	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
4-Isopropyltoluene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
4-Methyl-2-pentanone	5.0	U	3.5	5.0	10	ug/L	5	15-Mar-2018 16:56
Acetone	5.0	U	2.0	5.0	10	ug/L	5	15-Mar-2018 16:56
<b>Benzene</b>	<b>5.2</b>		<b>1.0</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56
Bromobenzene	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
Bromochloromethane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
Bromodichloromethane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
Bromoform	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
Bromomethane	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56
Carbon disulfide	5.0	U	3.0	5.0	10	ug/L	5	15-Mar-2018 16:56
Carbon tetrachloride	2.5	U	2.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
Chlorobenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56
Chloroethane	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW20-030718  
 Collection Date: 07-Mar-2018 10:00

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-01  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Chloromethane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
<b>cis-1,2-Dichloroethene</b>	<b>76</b>		<b>1.0</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56	
cis-1,3-Dichloropropene	2.5	U	0.50	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Dibromochloromethane	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Dibromomethane	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Dichlorodifluoromethane	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Ethylbenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Hexachlorobutadiene	2.5	U	5.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Isopropylbenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
m,p-Xylene	5.0	U	2.5	5.0	10	ug/L	5	15-Mar-2018 16:56	
Methylene chloride	5.0	U	2.0	5.0	10	ug/L	5	15-Mar-2018 16:56	
n-Butylbenzene	2.5	U	2.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
n-Propylbenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Naphthalene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
o-Xylene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
sec-Butylbenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Styrene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
tert-Butylbenzene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Tetrachloroethene	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
Toluene	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
trans-1,2-Dichloroethene	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
trans-1,3-Dichloropropene	2.5	U	1.0	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
<b>Trichloroethene</b>	<b>330</b>		<b>1.0</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56	
Trichlorofluoromethane	2.5	U	1.5	2.5	5.0	ug/L	5	15-Mar-2018 16:56	
<b>Vinyl chloride</b>	<b>110</b>		<b>1.0</b>	<b>2.5</b>	<b>5.0</b>	<b>ug/L</b>	5	15-Mar-2018 16:56	
Surr: 1,2-Dichloroethane-d4	85.0			0	81-118	%REC	5	15-Mar-2018 16:56	
Surr: 1,2-Dichloroethane-d4	84.0			0	81-118	%REC	50	15-Mar-2018 17:23	
Surr: 4-Bromofluorobenzene	96.5			0	85-114	%REC	50	15-Mar-2018 17:23	
Surr: 4-Bromofluorobenzene	95.5			0	85-114	%REC	5	15-Mar-2018 16:56	
Surr: Dibromofluoromethane	86.3			0	80-119	%REC	5	15-Mar-2018 16:56	
Surr: Dibromofluoromethane	86.1			0	80-119	%REC	50	15-Mar-2018 17:23	
Surr: Toluene-d8	108			0	89-112	%REC	50	15-Mar-2018 17:23	
Surr: Toluene-d8	106			0	89-112	%REC	5	15-Mar-2018 16:56	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>				Prep:SW3010A / 13-Mar-2018		Analyst: JCJ	
<b>Iron</b>	<b>0.660</b>		<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	1	15-Mar-2018 20:27	
<b>Manganese</b>	<b>1.34</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	1	15-Mar-2018 20:27	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW20-030718  
 Collection Date: 07-Mar-2018 10:00

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-01  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>DISSOLVED METALS BY SW6020A</b>	<b>Method:SW6020 (dissolved)</b>					Prep:SW3010A / 13-Mar-2018		Analyst: JDE
Iron	0.463		0.0120	0.100	0.200	mg/L	1	20-Mar-2018 16:57
Manganese	1.55		0.00350	0.00500	0.0250	mg/L	5	21-Mar-2018 12:56
<b>PHOSPHORUS BY E365.3</b>	<b>Method:E365.3</b>					Prep:E365.3 / 21-Mar-2018		Analyst: MZD
Phosphorus, Total (As P)	0.0250	U	0.0200	0.0250	0.0500	mg/L	1	22-Mar-2018 14:17
<b>SULFIDE BY E376.1</b>	<b>Method:E376.1</b>							Analyst: JHD
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	13-Mar-2018 17:05
<b>TOTAL ORGANIC CARBON BY E415.1</b>	<b>Method:E415.1</b>							Analyst: KMU
Organic Carbon, Total	14.5		0.500	0.500	1.00	mg/L	1	20-Mar-2018 20:31
<b>ALKALINITY BY SM2320B</b>	<b>Method:SM2320B</b>							Analyst: AJH
Alkalinity, Total (As CaCO3)	848		5.00	5.00	5.00	mg/L	1	08-Mar-2018 23:14
<b>ANIONS BY SW9056A</b>	<b>Method:SW9056</b>							Analyst: KMU
Chloride	1,510		4.00	5.00	10.0	mg/L	20	09-Mar-2018 01:00
Nitrogen, Nitrate (As N)	0.0500	U	0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 00:45
Nitrogen, Nitrite (As N)	6.90		0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 00:45
Sulfate	1,840		4.00	5.00	10.0	mg/L	20	09-Mar-2018 01:00
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	14-Mar-2018 08:55
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	27-Mar-2018 15:32
<b>SUBCONTRACT ANALYSIS - RSK</b>	<b>Method:NA</b>							Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 08:05
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	27-Mar-2018 15:32

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: LHSMW07-030718  
 Collection Date: 07-Mar-2018 11:10

## ANALYTICAL REPORT

WorkOrder:HS18030365  
 Lab ID:HS18030365-02  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						
								Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 16:02
<b>1,1,2-Trichloroethane</b>	<b>3.6</b>		<b>0.30</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 16:02
<b>1,1-Dichloroethane</b>	<b>51</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 16:02
<b>1,1-Dichloroethene</b>	<b>370</b>		<b>2.0</b>	<b>5.0</b>	<b>10</b>	<b>ug/L</b>	10	15-Mar-2018 16:29
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 16:02
<b>1,2-Dichloroethane</b>	<b>2.0</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 16:02
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	15-Mar-2018 16:02
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	15-Mar-2018 16:02
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	15-Mar-2018 16:02
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	15-Mar-2018 16:02
<b>Benzene</b>	<b>0.63</b>	<b>J</b>	<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 16:02
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	15-Mar-2018 16:02
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 16:02
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: LHSMW07-030718  
 Collection Date: 07-Mar-2018 11:10

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-02  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
<b>cis-1,2-Dichloroethene</b>	<b>11</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 16:02	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	15-Mar-2018 16:02	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	15-Mar-2018 16:02	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
<b>Trichloroethene</b>	<b>34</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 16:02	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 16:02	
<b>Vinyl chloride</b>	<b>5.0</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 16:02	
Surr: 1,2-Dichloroethane-d4	85.0			0	81-118	%REC	1	15-Mar-2018 16:02	
Surr: 1,2-Dichloroethane-d4	85.4			0	81-118	%REC	10	15-Mar-2018 16:29	
Surr: 4-Bromofluorobenzene	93.5			0	85-114	%REC	10	15-Mar-2018 16:29	
Surr: 4-Bromofluorobenzene	96.7			0	85-114	%REC	1	15-Mar-2018 16:02	
Surr: Dibromofluoromethane	85.5			0	80-119	%REC	1	15-Mar-2018 16:02	
Surr: Dibromofluoromethane	85.1			0	80-119	%REC	10	15-Mar-2018 16:29	
Surr: Toluene-d8	108			0	89-112	%REC	10	15-Mar-2018 16:29	
Surr: Toluene-d8	104			0	89-112	%REC	1	15-Mar-2018 16:02	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>				Prep:SW3010A / 13-Mar-2018		Analyst: JCJ	
<b>Iron</b>	<b>0.417</b>		<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	1	15-Mar-2018 20:30	
<b>Manganese</b>	<b>0.119</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	1	15-Mar-2018 20:30	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: LHSMW07-030718  
 Collection Date: 07-Mar-2018 11:10

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-02  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>DISSOLVED METALS BY SW6020A</b>	<b>Method:SW6020 (dissolved)</b>					Prep:SW3010A / 13-Mar-2018		Analyst: JDE
Iron	0.0325	J	0.0120	0.100	0.200	mg/L	1	20-Mar-2018 17:07
Manganese	0.137		0.000700	0.00100	0.00500	mg/L	1	20-Mar-2018 17:07
<b>PHOSPHORUS BY E365.3</b>	<b>Method:E365.3</b>					Prep:E365.3 / 21-Mar-2018		Analyst: MZD
Phosphorus, Total (As P)	0.0250	U	0.0200	0.0250	0.0500	mg/L	1	22-Mar-2018 14:17
<b>SULFIDE BY E376.1</b>	<b>Method:E376.1</b>							Analyst: JHD
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	13-Mar-2018 17:05
<b>TOTAL ORGANIC CARBON BY E415.1</b>	<b>Method:E415.1</b>							Analyst: KMU
Organic Carbon, Total	6.67		0.500	0.500	1.00	mg/L	1	20-Mar-2018 20:44
<b>ALKALINITY BY SM2320B</b>	<b>Method:SM2320B</b>							Analyst: AJH
Alkalinity, Total (As CaCO3)	757		5.00	5.00	5.00	mg/L	1	08-Mar-2018 23:22
<b>ANIONS BY SW9056A</b>	<b>Method:SW9056</b>							Analyst: KMU
Chloride	2,420		8.00	10.0	20.0	mg/L	40	16-Mar-2018 20:43
Nitrogen, Nitrate (As N)	0.0500	U	0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 01:15
Nitrogen, Nitrite (As N)	11.7		0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 01:15
Sulfate	2,700		8.00	10.0	20.0	mg/L	40	16-Mar-2018 20:43
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	14-Mar-2018 08:55
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	27-Mar-2018 15:32
<b>SUBCONTRACT ANALYSIS - RSK</b>	<b>Method:NA</b>							Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 08:05
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	27-Mar-2018 15:32

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW11-030718  
 Collection Date: 07-Mar-2018 12:25

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-03  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>							Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
<b>1,1-Dichloroethene</b>	<b>10</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	15-Mar-2018 15:37	
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	15-Mar-2018 15:37	
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	15-Mar-2018 15:37	
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	15-Mar-2018 15:37	
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	15-Mar-2018 15:37	
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	15-Mar-2018 15:37	
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW11-030718  
 Collection Date: 07-Mar-2018 12:25

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-03  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	15-Mar-2018 15:37	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	15-Mar-2018 15:37	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	15-Mar-2018 15:37	
<i>Surr: 1,2-Dichloroethane-d4</i>	85.6			0	81-118	%REC	1	15-Mar-2018 15:37	
<i>Surr: 4-Bromofluorobenzene</i>	96.7			0	85-114	%REC	1	15-Mar-2018 15:37	
<i>Surr: Dibromofluoromethane</i>	88.5			0	80-119	%REC	1	15-Mar-2018 15:37	
<i>Surr: Toluene-d8</i>	105			0	89-112	%REC	1	15-Mar-2018 15:37	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JCJ	
Iron	0.445		0.0120	0.100	0.200	mg/L	1	15-Mar-2018 20:32	
Manganese	0.383		0.000700	0.00100	0.00500	mg/L	1	15-Mar-2018 20:32	
<b>DISSOLVED METALS BY SW6020A</b>		<b>Method:SW6020 (dissolved)</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JDE	
Iron	0.0143	J	0.0120	0.100	0.200	mg/L	1	20-Mar-2018 17:09	
Manganese	0.393		0.000700	0.00100	0.00500	mg/L	1	20-Mar-2018 17:09	
<b>PHOSPHORUS BY E365.3</b>		<b>Method:E365.3</b>						Prep:E365.3 / 21-Mar-2018 Analyst: MZD	
Phosphorus, Total (As P)	0.0250	U	0.0200	0.0250	0.0500	mg/L	1	22-Mar-2018 14:17	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW11-030718  
 Collection Date: 07-Mar-2018 12:25

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-03  
 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>SULFIDE BY E376.1</b>		<b>Method:E376.1</b>							Analyst: JHD
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	13-Mar-2018 17:05	
<b>TOTAL ORGANIC CARBON BY E415.1</b>		<b>Method:E415.1</b>							Analyst: KMU
Organic Carbon, Total	5.28		0.500	0.500	1.00	mg/L	1	20-Mar-2018 21:00	
<b>ALKALINITY BY SM2320B</b>		<b>Method:SM2320B</b>							Analyst: AJH
Alkalinity, Total (As CaCO3)	446		5.00	5.00	5.00	mg/L	1	08-Mar-2018 23:28	
<b>ANIONS BY SW9056A</b>		<b>Method:SW9056</b>							Analyst: KMU
Chloride	2,530		8.00	10.0	20.0	mg/L	40	16-Mar-2018 20:57	
Nitrogen, Nitrate (As N)	0.0500	U	0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 01:44	
Nitrogen, Nitrite (As N)	14.6		0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 01:44	
Sulfate	1,260		4.00	5.00	10.0	mg/L	20	09-Mar-2018 01:58	
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>		<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	14-Mar-2018 08:55	
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>		<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	27-Mar-2018 15:32	
<b>SUBCONTRACT ANALYSIS - RSK</b>		<b>Method:NA</b>							Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 08:05	
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>		<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	27-Mar-2018 15:32	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: Trip Blank  
 Collection Date: 07-Mar-2018 00:01

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-04  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>							Analyst: AKP
1,1,1,2-Tetrachloroethane	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
1,1,1-Trichloroethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
1,1,2,2-Tetrachloroethane	25	U	25	25	50	ug/L	50	15-Mar-2018 13:57	
1,1,2-Trichloroethane	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
1,1-Dichloroethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
1,1-Dichloroethene	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
1,1-Dichloropropene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
1,2,3-Trichlorobenzene	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
1,2,3-Trichloropropane	25	U	25	25	50	ug/L	50	15-Mar-2018 13:57	
1,2,4-Trichlorobenzene	25	U	25	25	50	ug/L	50	15-Mar-2018 13:57	
1,2,4-Trimethylbenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
1,2-Dibromo-3-chloropropane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
1,2-Dibromoethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
1,2-Dichlorobenzene	25	U	25	25	50	ug/L	50	15-Mar-2018 13:57	
1,2-Dichloroethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
1,2-Dichloropropane	25	U	25	25	50	ug/L	50	15-Mar-2018 13:57	
1,3,5-Trimethylbenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
1,3-Dichlorobenzene	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
1,3-Dichloropropane	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
1,4-Dichlorobenzene	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
2,2-Dichloropropane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
2-Butanone	50	U	25	50	100	ug/L	50	15-Mar-2018 13:57	
2-Chlorotoluene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
2-Hexanone	50	U	50	50	100	ug/L	50	15-Mar-2018 13:57	
4-Chlorotoluene	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
4-Isopropyltoluene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
4-Methyl-2-pentanone	50	U	35	50	100	ug/L	50	15-Mar-2018 13:57	
Acetone	50	U	20	50	100	ug/L	50	15-Mar-2018 13:57	
Benzene	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
Bromobenzene	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
Bromochloromethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
Bromodichloromethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
Bromoform	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
Bromomethane	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
Carbon disulfide	50	U	30	50	100	ug/L	50	15-Mar-2018 13:57	
Carbon tetrachloride	25	U	25	25	50	ug/L	50	15-Mar-2018 13:57	
Chlorobenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Chloroethane	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: Trip Blank  
 Collection Date: 07-Mar-2018 00:01

**ANALYTICAL REPORT**

WorkOrder:HS18030365  
 Lab ID:HS18030365-04  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD</b>		<b>Method:SW8260</b>							Analyst: AKP
<b>8260C</b>									
Chloroform	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
Chloromethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
cis-1,2-Dichloroethene	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
cis-1,3-Dichloropropene	25	U	5.0	25	50	ug/L	50	15-Mar-2018 13:57	
Dibromochloromethane	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Dibromomethane	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
Dichlorodifluoromethane	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Ethylbenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Hexachlorobutadiene	25	U	50	25	50	ug/L	50	15-Mar-2018 13:57	
Isopropylbenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
m,p-Xylene	50	U	25	50	100	ug/L	50	15-Mar-2018 13:57	
Methylene chloride	50	U	20	50	100	ug/L	50	15-Mar-2018 13:57	
n-Butylbenzene	25	U	20	25	50	ug/L	50	15-Mar-2018 13:57	
n-Propylbenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Naphthalene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
o-Xylene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
sec-Butylbenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Styrene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
tert-Butylbenzene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Tetrachloroethene	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Toluene	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
trans-1,2-Dichloroethene	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
trans-1,3-Dichloropropene	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
Trichloroethene	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
Trichlorofluoromethane	25	U	15	25	50	ug/L	50	15-Mar-2018 13:57	
Vinyl chloride	25	U	10	25	50	ug/L	50	15-Mar-2018 13:57	
<i>Surr: 1,2-Dichloroethane-d4</i>	<i>83.1</i>			<i>0</i>	<i>81-118</i>	<i>%REC</i>	<i>50</i>	<i>15-Mar-2018 13:57</i>	
<i>Surr: 4-Bromofluorobenzene</i>	<i>97.0</i>			<i>0</i>	<i>85-114</i>	<i>%REC</i>	<i>50</i>	<i>15-Mar-2018 13:57</i>	
<i>Surr: Dibromofluoromethane</i>	<i>86.4</i>			<i>0</i>	<i>80-119</i>	<i>%REC</i>	<i>50</i>	<i>15-Mar-2018 13:57</i>	
<i>Surr: Toluene-d8</i>	<i>104</i>			<i>0</i>	<i>89-112</i>	<i>%REC</i>	<i>50</i>	<i>15-Mar-2018 13:57</i>	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## WEIGHT LOG

**Client:** Bhate Environmental Associates, Inc.**Project:** LHAAP-58**WorkOrder:** HS18030365**Batch ID:** 126131      **Method:** ICP-MS METALS BY SW6020A      **Prep:** 3010A

<b>SampleID</b>	<b>Container</b>	<b>Sample Wt/Vol</b>	<b>Final Volume</b>	<b>Prep Factor</b>
HS18030365-01	1	10	10 (mL)	1
HS18030365-02	1	10	10 (mL)	1
HS18030365-03	1	10	10 (mL)	1

**Batch ID:** 126134      **Method:** DISSOLVED METALS BY SW6020A      **Prep:** 3010A DISS

<b>SampleID</b>	<b>Container</b>	<b>Sample Wt/Vol</b>	<b>Final Volume</b>	<b>Prep Factor</b>
HS18030365-01	1	10	10 (mL)	1
HS18030365-02	1	10	10 (mL)	1
HS18030365-03	1	10	10 (mL)	1

**Batch ID:** 126467      **Method:** PHOSPHORUS BY E365.3      **Prep:** P\_TW\_PR

<b>SampleID</b>	<b>Container</b>	<b>Sample Wt/Vol</b>	<b>Final Volume</b>	<b>Prep Factor</b>
HS18030365-01	1	50	50 (mL)	1
HS18030365-02	1	50	50 (mL)	1
HS18030365-03	1	50	50 (mL)	1

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID</b> 126131	<b>Test Name :</b> ICP-MS METALS BY SW6020A		<b>Matrix:</b> Groundwater			
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00		13 Mar 2018 11:00	15 Mar 2018 20:27	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10		13 Mar 2018 11:00	15 Mar 2018 20:30	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25		13 Mar 2018 11:00	15 Mar 2018 20:32	1
<b>Batch ID</b> 126134	<b>Test Name :</b> DISSOLVED METALS BY SW6020A		<b>Matrix:</b> Groundwater			
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00		13 Mar 2018 11:00	21 Mar 2018 12:56	5
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00		13 Mar 2018 11:00	20 Mar 2018 16:57	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10		13 Mar 2018 11:00	20 Mar 2018 17:07	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25		13 Mar 2018 11:00	20 Mar 2018 17:09	1
<b>Batch ID</b> 126467	<b>Test Name :</b> PHOSPHORUS BY E365.3		<b>Matrix:</b> Groundwater			
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00		21 Mar 2018 14:00	22 Mar 2018 14:17	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10		21 Mar 2018 14:00	22 Mar 2018 14:17	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25		21 Mar 2018 14:00	22 Mar 2018 14:17	1
<b>Batch ID</b> R312233	<b>Test Name :</b> ALKALINITY BY SM2320B		<b>Matrix:</b> Groundwater			
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			08 Mar 2018 23:14	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			08 Mar 2018 23:22	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			08 Mar 2018 23:28	1
<b>Batch ID</b> R312306	<b>Test Name :</b> ANIONS BY SW9056A		<b>Matrix:</b> Groundwater			
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			09 Mar 2018 01:00	20
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			09 Mar 2018 00:45	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			16 Mar 2018 20:43	40
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			09 Mar 2018 01:15	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			16 Mar 2018 20:57	40
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			09 Mar 2018 01:58	20
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			09 Mar 2018 01:44	1
<b>Batch ID</b> R312419	<b>Test Name :</b> SUBCONTRACT ANALYSIS - DHC/DHB		<b>Matrix:</b> Groundwater			
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			14 Mar 2018 08:55	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			14 Mar 2018 08:55	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			14 Mar 2018 08:55	1
<b>Batch ID</b> R312577	<b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C		<b>Matrix:</b> Water			
HS18030365-04	Trip Blank	07 Mar 2018 00:01			15 Mar 2018 13:57	50
<b>Batch ID</b> R312577	<b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C		<b>Matrix:</b> Groundwater			
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			15 Mar 2018 17:23	50
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			15 Mar 2018 16:56	5
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			15 Mar 2018 16:29	10
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			15 Mar 2018 16:02	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			15 Mar 2018 15:37	1

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID</b> R312697		<b>Test Name :</b> SULFIDE BY E376.1			<b>Matrix:</b> Groundwater	
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			13 Mar 2018 17:05	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			13 Mar 2018 17:05	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			13 Mar 2018 17:05	1
<b>Batch ID</b> R312878		<b>Test Name :</b> TOTAL ORGANIC CARBON BY E415.1			<b>Matrix:</b> Groundwater	
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			20 Mar 2018 20:31	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			20 Mar 2018 20:44	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			20 Mar 2018 21:00	1
<b>Batch ID</b> R313200		<b>Test Name :</b> SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS			<b>Matrix:</b> Groundwater	
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			27 Mar 2018 15:32	1
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			27 Mar 2018 15:32	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			27 Mar 2018 15:32	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			27 Mar 2018 15:32	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			27 Mar 2018 15:32	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			27 Mar 2018 15:32	1
<b>Batch ID</b> R313388		<b>Test Name :</b> SUBCONTRACT ANALYSIS - RSK			<b>Matrix:</b> Groundwater	
HS18030365-01	35AWW20-030718	07 Mar 2018 10:00			30 Mar 2018 08:05	1
HS18030365-02	LHSMW07-030718	07 Mar 2018 11:10			30 Mar 2018 08:05	1
HS18030365-03	35AWW11-030718	07 Mar 2018 12:25			30 Mar 2018 08:05	1

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID: 126131		Instrument: ICPMS04		Method: SW6020						
<b>MBLK</b>	Sample ID: <b>MBLK-126131</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:28</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475111</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.00100	0.00500								U
<b>LCS</b>	Sample ID: <b>LCS-126131</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:30</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475112</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	5.028	0.200	5	0	101	80 - 120				
Manganese	0.04894	0.00500	0.05	0	97.9	80 - 120				
<b>MS</b>	Sample ID: <b>HS18030472-02MS</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:41</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475117</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.792	0.200	5	0.2489	90.9	80 - 120				
Manganese	0.2801	0.00500	0.05	0.2357	88.8	80 - 120				O
<b>MSD</b>	Sample ID: <b>HS18030472-02MSD</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:43</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475118</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.716	0.200	5	0.2489	89.3	80 - 120	4.792	1.6	20	
Manganese	0.2738	0.00500	0.05	0.2357	76.1	80 - 120	0.2801	2.3	20	SO
<b>PDS</b>	Sample ID: <b>HS18030472-02PDS</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:46</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475119</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	8.895	0.200	10	0.2489	86.5	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID: 126131		Instrument: ICPMS04		Method: SW6020						
<b>PDS</b>	Sample ID: <b>HS18030472-02PDS</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 15:57</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475373</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Manganese	0.3109	0.00500	0.1	0.2357	75.1	75 - 125				
<b>SD</b>	Sample ID: <b>HS18030472-02SD</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:39</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475116</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>5</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	0.2493	1.00					0.2489	0	10	J
Manganese	0.2312	0.0250					0.2357	1.91	10	
<b>The following samples were analyzed in this batch:</b>										
HS18030365-01      HS18030365-02      HS18030365-03										

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID: 126134		Instrument: ICPMS05		Method: SW6020 (dissolved) (DISSOLVED)						
<b>MBLK</b>	Sample ID: <b>MBLK-126134</b>	Units: <b>mg/L</b>			Analysis Date: <b>20-Mar-2018 16:53</b>					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo: <b>4481013</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	0.100	0.200							U	
Manganese	0.00100	0.00500							U	
<b>LCS</b>	Sample ID: <b>LCS-126134</b>	Units: <b>mg/L</b>			Analysis Date: <b>20-Mar-2018 16:55</b>					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo: <b>4481014</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	5.152	0.200	5	0	103	80 - 120				
Manganese	0.05024	0.00500	0.05	0	100	80 - 120				
<b>MS</b>	Sample ID: <b>HS18030365-01MS</b>	Units: <b>mg/L</b>			Analysis Date: <b>20-Mar-2018 17:01</b>					
Client ID: <b>35AWW20-030718</b>	Run ID: <b>ICPMS05_312756</b>	SeqNo: <b>4481017</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	5.17	0.200	5	0.4629	94.1	75 - 125				
Manganese	1.735	0.00500	0.05	1.729	13.1	75 - 125			SO	
<b>MSD</b>	Sample ID: <b>HS18030365-01MSD</b>	Units: <b>mg/L</b>			Analysis Date: <b>20-Mar-2018 17:03</b>					
Client ID: <b>35AWW20-030718</b>	Run ID: <b>ICPMS05_312756</b>	SeqNo: <b>4481018</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	5.252	0.200	5	0.4629	95.8	75 - 125	5.17	1.58	20	
Manganese	1.754	0.00500	0.05	1.729	50.9	75 - 125	1.735	1.08	20 SO	
<b>PDS</b>	Sample ID: <b>HS18030365-01PDS</b>	Units: <b>mg/L</b>			Analysis Date: <b>20-Mar-2018 17:05</b>					
Client ID: <b>35AWW20-030718</b>	Run ID: <b>ICPMS05_312756</b>	SeqNo: <b>4481019</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	9.775	0.200	10	0.4629	93.1	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID:	126134	Instrument:	ICPMS05	Method:	SW6020 (dissolved) (DISSOLVED)
<b>PDS</b>	Sample ID: <b>HS18030365-01PDS</b>	Units:	mg/L	Analysis Date:	<b>21-Mar-2018 13:00</b>
Client ID:	<b>35AWW20-030718</b>	Run ID:	<b>ICPMS05_312849</b>	SeqNo:	<b>4482372</b> PrepDate: <b>13-Mar-2018</b> DF: <b>5</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC Control Limit RPD Ref Value %RPD RPD Limit Qual
Manganese	2.022	0.0250	0.5	1.552	94.1 75 - 125
<b>SD</b>	Sample ID: <b>HS18030365-01SD</b>	Units:	mg/L	Analysis Date:	<b>20-Mar-2018 16:59</b>
Client ID:	<b>35AWW20-030718</b>	Run ID:	<b>ICPMS05_312756</b>	SeqNo:	<b>4481016</b> PrepDate: <b>13-Mar-2018</b> DF: <b>5</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC Control Limit RPD Ref Value %D %D Limit Qual
Iron	0.4875	1.00			0.4629 0 10 J
<b>SD</b>	Sample ID: <b>HS18030365-01SD</b>	Units:	mg/L	Analysis Date:	<b>21-Mar-2018 12:58</b>
Client ID:	<b>35AWW20-030718</b>	Run ID:	<b>ICPMS05_312849</b>	SeqNo:	<b>4482371</b> PrepDate: <b>13-Mar-2018</b> DF: <b>25</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC Control Limit RPD Ref Value %D %D Limit Qual
Manganese	1.534	0.125			1.552 1.13 10
<b>The following samples were analyzed in this batch:</b>					
HS18030365-01 HS18030365-02 HS18030365-03					

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
MBLK	Sample ID: VBLKW-180315	Units: ug/L			Analysis Date: 15-Mar-2018 12:38					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475726		PrepDate:		DF: 1				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	0.50	1.0								U
1,1,1-Trichloroethane	0.50	1.0								U
1,1,2,2-Tetrachloroethane	0.50	1.0								U
1,1,2-Trichloroethane	0.50	1.0								U
1,1-Dichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,1-Dichloropropene	0.50	1.0								U
1,2,3-Trichlorobenzene	0.50	1.0								U
1,2,3-Trichloropropane	0.50	1.0								U
1,2,4-Trichlorobenzene	0.50	1.0								U
1,2,4-Trimethylbenzene	0.50	1.0								U
1,2-Dibromo-3-chloropropane	0.50	1.0								U
1,2-Dibromoethane	0.50	1.0								U
1,2-Dichlorobenzene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
1,2-Dichloropropane	0.50	1.0								U
1,3,5-Trimethylbenzene	0.50	1.0								U
1,3-Dichlorobenzene	0.50	1.0								U
1,3-Dichloropropane	0.50	1.0								U
1,4-Dichlorobenzene	0.50	1.0								U
2,2-Dichloropropane	0.50	1.0								U
2-Butanone	1.0	2.0								U
2-Chlorotoluene	0.50	1.0								U
2-Hexanone	1.0	2.0								U
4-Chlorotoluene	0.50	1.0								U
4-Isopropyltoluene	0.50	1.0								U
4-Methyl-2-pentanone	1.0	2.0								U
Acetone	1.0	2.0								U
Benzene	0.50	1.0								U
Bromobenzene	0.50	1.0								U
Bromochloromethane	0.50	1.0								U
Bromodichloromethane	0.50	1.0								U
Bromoform	0.50	1.0								U
Bromomethane	0.50	1.0								U

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
MBLK	Sample ID: VBLKW-180315	Units: ug/L			Analysis Date: 15-Mar-2018 12:38					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475726		PrepDate:		DF: 1				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	1.0	2.0								U
Carbon tetrachloride	0.50	1.0								U
Chlorobenzene	0.50	1.0								U
Chloroethane	0.50	1.0								U
Chloroform	0.50	1.0								U
Chloromethane	0.50	1.0								U
cis-1,2-Dichloroethene	0.50	1.0								U
cis-1,3-Dichloropropene	0.50	1.0								U
Dibromochloromethane	0.50	1.0								U
Dibromomethane	0.50	1.0								U
Dichlorodifluoromethane	0.50	1.0								U
Ethylbenzene	0.50	1.0								U
Hexachlorobutadiene	0.50	1.0								U
Isopropylbenzene	0.50	1.0								U
m,p-Xylene	1.0	2.0								U
Methylene chloride	1.0	2.0								U
Naphthalene	0.50	1.0								U
n-Butylbenzene	0.50	1.0								U
n-Propylbenzene	0.50	1.0								U
o-Xylene	0.50	1.0								U
sec-Butylbenzene	0.50	1.0								U
Styrene	0.50	1.0								U
tert-Butylbenzene	0.50	1.0								U
Tetrachloroethene	0.50	1.0								U
Toluene	0.50	1.0								U
trans-1,2-Dichloroethene	0.50	1.0								U
trans-1,3-Dichloropropene	0.50	1.0								U
Trichloroethene	0.50	1.0								U
Trichlorofluoromethane	0.50	1.0								U
Vinyl chloride	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	42.41	1.0	50	0	84.8	81 - 118				
Surr: 4-Bromofluorobenzene	48.42	1.0	50	0	96.8	85 - 114				
Surr: Dibromofluoromethane	43.03	1.0	50	0	86.1	80 - 119				
Surr: Toluene-d8	52.87	1.0	50	0	106	89 - 112				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
LCS	Sample ID: VLCSW-180315	Units: ug/L			Analysis Date: 15-Mar-2018 11:49					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475724	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	46.9	1.0	50	0	93.8	78 - 124				
1,1,1-Trichloroethane	48.62	1.0	50	0	97.2	74 - 131				
1,1,2,2-Tetrachloroethane	40.04	1.0	50	0	80.1	71 - 121				
1,1,2-Trichloroethane	44.36	1.0	50	0	88.7	80 - 119				
1,1-Dichloroethane	45.15	1.0	50	0	90.3	77 - 125				
1,1-Dichloroethene	48.64	1.0	50	0	97.3	71 - 131				
1,1-Dichloropropene	49.8	1.0	50	0	99.6	79 - 125				
1,2,3-Trichlorobenzene	45.7	1.0	50	0	91.4	69 - 129				
1,2,3-Trichloropropane	42.06	1.0	50	0	84.1	73 - 122				
1,2,4-Trichlorobenzene	46.53	1.0	50	0	93.1	69 - 130				
1,2,4-Trimethylbenzene	46.96	1.0	50	0	93.9	76 - 124				
1,2-Dibromo-3-chloropropane	42.54	1.0	50	0	85.1	62 - 128				
1,2-Dibromoethane	47.61	1.0	50	0	95.2	77 - 121				
1,2-Dichlorobenzene	41.55	1.0	50	0	83.1	80 - 119				
1,2-Dichloroethane	47.6	1.0	50	0	95.2	73 - 128				
1,2-Dichloropropane	46.23	1.0	50	0	92.5	78 - 122				
1,3,5-Trimethylbenzene	47.07	1.0	50	0	94.1	75 - 124				
1,3-Dichlorobenzene	42.67	1.0	50	0	85.3	80 - 119				
1,3-Dichloropropane	44.23	1.0	50	0	88.5	80 - 119				
1,4-Dichlorobenzene	41.9	1.0	50	0	83.8	79 - 118				
2,2-Dichloropropane	48.57	1.0	50	0	97.1	60 - 139				
2-Butanone	97.52	2.0	100	0	97.5	56 - 143				
2-Chlorotoluene	45.8	1.0	50	0	91.6	79 - 122				
2-Hexanone	96.27	2.0	100	0	96.3	57 - 139				
4-Chlorotoluene	46.79	1.0	50	0	93.6	78 - 122				
4-Isopropyltoluene	41.7	1.0	50	0	83.4	77 - 127				
4-Methyl-2-pentanone	88.67	2.0	100	0	88.7	67 - 130				
Acetone	94.99	2.0	100	0	95.0	39 - 160				
Benzene	46.74	1.0	50	0	93.5	79 - 120				
Bromobenzene	41.2	1.0	50	0	82.4	80 - 120				
Bromochloromethane	51.12	1.0	50	0	102	78 - 123				
Bromodichloromethane	49.03	1.0	50	0	98.1	79 - 125				
Bromoform	50.72	1.0	50	0	101	66 - 130				
Bromomethane	50.13	1.0	50	0	100	53 - 141				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
LCS	Sample ID: VLCSW-180315	Units: ug/L			Analysis Date: 15-Mar-2018 11:49					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475724	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	93.95	2.0	100	0	94.0	64 - 133				
Carbon tetrachloride	47.17	1.0	50	0	94.3	72 - 136				
Chlorobenzene	45.46	1.0	50	0	90.9	80 - 120				
Chloroethane	44.39	1.0	50	0	88.8	82 - 118				
Chloroform	45.1	1.0	50	0	90.2	79 - 124				
Chloromethane	47.55	1.0	50	0	95.1	50 - 139				
cis-1,2-Dichloroethene	48.83	1.0	50	0	97.7	78 - 123				
cis-1,3-Dichloropropene	51.57	1.0	50	0	103	75 - 124				
Dibromochloromethane	48.68	1.0	50	0	97.4	74 - 126				
Dibromomethane	51.31	1.0	50	0	103	79 - 123				
Dichlorodifluoromethane	42.06	1.0	50	0	84.1	32 - 152				
Ethylbenzene	50.71	1.0	50	0	101	79 - 121				
Hexachlorobutadiene	44.18	1.0	50	0	88.4	66 - 134				
Isopropylbenzene	45.52	1.0	50	0	91.0	72 - 131				
m,p-Xylene	89.33	2.0	100	0	89.3	80 - 121				
Methylene chloride	43.49	2.0	50	0	87.0	74 - 124				
Naphthalene	49.21	1.0	50	0	98.4	61 - 128				
n-Butylbenzene	43.51	1.0	50	0	87.0	75 - 128				
n-Propylbenzene	40.94	1.0	50	0	81.9	76 - 126				
o-Xylene	45.48	1.0	50	0	91.0	78 - 122				
sec-Butylbenzene	42.56	1.0	50	0	85.1	77 - 126				
Styrene	45.91	1.0	50	0	91.8	78 - 128				
tert-Butylbenzene	41.51	1.0	50	0	83.0	78 - 124				
Tetrachloroethene	46.69	1.0	50	0	93.4	74 - 129				
Toluene	43.54	1.0	50	0	87.1	80 - 121				
trans-1,2-Dichloroethene	49.48	1.0	50	0	99.0	75 - 124				
trans-1,3-Dichloropropene	52.61	1.0	50	0	105	73 - 127				
Trichloroethene	49.31	1.0	50	0	98.6	79 - 123				
Trichlorofluoromethane	46.07	1.0	50	0	92.1	65 - 141				
Vinyl chloride	46.38	1.0	50	0	92.8	58 - 137				
Surr: 1,2-Dichloroethane-d4	44.43	1.0	50	0	88.9	81 - 118				
Surr: 4-Bromofluorobenzene	51.09	1.0	50	0	102	85 - 114				
Surr: Dibromofluoromethane	42.16	1.0	50	0	84.3	80 - 119				
Surr: Toluene-d8	50.57	1.0	50	0	101	89 - 112				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
MS	Sample ID: HS18030510-01MS	Units: ug/L			Analysis Date: 15-Mar-2018 14:21					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475730	PrepDate:	DF: 10						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	428.8	10	500	0	85.8	78 - 124				
1,1,1-Trichloroethane	472.8	10	500	0	94.6	74 - 131				
1,1,2,2-Tetrachloroethane	344.7	10	500	0	68.9	71 - 121				S
1,1,2-Trichloroethane	383.7	10	500	0	76.7	80 - 119				S
1,1-Dichloroethane	419.6	10	500	0	83.9	77 - 125				
1,1-Dichloroethene	465.6	10	500	0	93.1	71 - 131				
1,1-Dichloropropene	497.8	10	500	0	99.6	79 - 125				
1,2,3-Trichlorobenzene	414	10	500	0	82.8	69 - 129				
1,2,3-Trichloropropane	365.5	10	500	0	73.1	73 - 122				
1,2,4-Trichlorobenzene	428	10	500	0	85.6	69 - 130				
1,2,4-Trimethylbenzene	448.6	10	500	0	89.7	76 - 124				
1,2-Dibromo-3-chloropropane	338.4	10	500	0	67.7	62 - 128				
1,2-Dibromoethane	411	10	500	0	82.2	77 - 121				
1,2-Dichlorobenzene	387.6	10	500	0	77.5	80 - 119				S
1,2-Dichloroethane	402	10	500	0	80.4	73 - 128				
1,2-Dichloropropane	405.8	10	500	0	81.2	78 - 122				
1,3,5-Trimethylbenzene	458.9	10	500	0	91.8	75 - 124				
1,3-Dichlorobenzene	402.7	10	500	0	80.5	80 - 119				
1,3-Dichloropropane	384.2	10	500	0	76.8	80 - 119				S
1,4-Dichlorobenzene	388.1	10	500	0	77.6	79 - 118				S
2,2-Dichloropropane	465.6	10	500	0	93.1	60 - 139				
2-Butanone	734.4	20	1000	0	73.4	56 - 143				
2-Chlorotoluene	450.7	10	500	0	90.1	79 - 122				
2-Hexanone	729.4	20	1000	0	72.9	57 - 139				
4-Chlorotoluene	445.5	10	500	0	89.1	78 - 122				
4-Isopropyltoluene	411.8	10	500	0	82.4	77 - 127				
4-Methyl-2-pentanone	756.3	20	1000	0	75.6	67 - 130				
Acetone	811.6	20	1000	0	81.2	39 - 160				
Benzene	430.7	10	500	0	86.1	79 - 120				
Bromobenzene	388.1	10	500	0	77.6	80 - 120				S
Bromochloromethane	454.9	10	500	0	91.0	78 - 123				
Bromodichloromethane	441.7	10	500	0	88.3	79 - 125				
Bromoform	438.8	10	500	0	87.8	66 - 130				
Bromomethane	415	10	500	0	83.0	53 - 141				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
MS	Sample ID: HS18030510-01MS	Units: ug/L			Analysis Date: 15-Mar-2018 14:21					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475730	PrepDate:	DF: 10						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	905.3	20	1000	0	90.5	64 - 133				
Carbon tetrachloride	491.3	10	500	0	98.3	72 - 136				
Chlorobenzene	418.2	10	500	0	83.6	80 - 120				
Chloroethane	392.5	10	500	0	78.5	82 - 118				S
Chloroform	413.5	10	500	0	82.7	79 - 124				
Chloromethane	449.7	10	500	0	89.9	50 - 139				
cis-1,2-Dichloroethene	446.5	10	500	0	89.3	78 - 123				
cis-1,3-Dichloropropene	453.4	10	500	0	90.7	75 - 124				
Dibromochloromethane	435.7	10	500	0	87.1	74 - 126				
Dibromomethane	431.1	10	500	0	86.2	79 - 123				
Dichlorodifluoromethane	441.2	10	500	0	88.2	32 - 152				
Ethylbenzene	489	10	500	0	97.8	79 - 121				
Hexachlorobutadiene	469.4	10	500	0	93.9	66 - 134				
Isopropylbenzene	443.1	10	500	0	88.6	72 - 131				
m,p-Xylene	852.3	20	1000	0	85.2	80 - 121				
Methylene chloride	409.5	20	500	0	81.9	74 - 124				
Naphthalene	407	10	500	0	81.4	61 - 128				
n-Butylbenzene	436.3	10	500	0	87.3	75 - 128				
n-Propylbenzene	405.9	10	500	0	81.2	76 - 126				
o-Xylene	423.5	10	500	0	84.7	78 - 122				
sec-Butylbenzene	430.2	10	500	0	86.0	77 - 126				
Styrene	408.4	10	500	0	81.7	78 - 128				
tert-Butylbenzene	417.2	10	500	0	83.4	78 - 124				
Tetrachloroethene	464.1	10	500	0	92.8	74 - 129				
Toluene	413.1	10	500	0	82.6	80 - 121				
trans-1,2-Dichloroethene	471.4	10	500	0	94.3	75 - 124				
trans-1,3-Dichloropropene	461.9	10	500	0	92.4	73 - 127				
Trichloroethene	477.2	10	500	0	95.4	79 - 123				
Trichlorofluoromethane	479.7	10	500	0	95.9	65 - 141				
Vinyl chloride	466.2	10	500	0	93.2	58 - 137				
Surr: 1,2-Dichloroethane-d4	436.7	10	500	0	87.3	81 - 118				
Surr: 4-Bromofluorobenzene	499.9	10	500	0	100.0	85 - 114				
Surr: Dibromofluoromethane	409.6	10	500	0	81.9	80 - 119				
Surr: Toluene-d8	506.9	10	500	0	101	89 - 112				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
MSD	Sample ID: HS18030510-01MSD	Units: ug/L			Analysis Date: 15-Mar-2018 14:46					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475731		PrepDate:		DF: 10				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	429.9	10	500	0	86.0	78 - 124	428.8	0.267	20	
1,1,1-Trichloroethane	462.7	10	500	0	92.5	74 - 131	472.8	2.17	20	
1,1,2,2-Tetrachloroethane	346.9	10	500	0	69.4	71 - 121	344.7	0.638	20	S
1,1,2-Trichloroethane	390.4	10	500	0	78.1	80 - 119	383.7	1.71	20	S
1,1-Dichloroethane	420.9	10	500	0	84.2	77 - 125	419.6	0.32	20	
1,1-Dichloroethene	462	10	500	0	92.4	71 - 131	465.6	0.778	20	
1,1-Dichloropropene	473.8	10	500	0	94.8	79 - 125	497.8	4.94	20	
1,2,3-Trichlorobenzene	414.7	10	500	0	82.9	69 - 129	414	0.189	20	
1,2,3-Trichloropropane	372.1	10	500	0	74.4	73 - 122	365.5	1.78	20	
1,2,4-Trichlorobenzene	430	10	500	0	86.0	69 - 130	428	0.485	20	
1,2,4-Trimethylbenzene	445	10	500	0	89.0	76 - 124	448.6	0.815	20	
1,2-Dibromo-3-chloropropane	351.7	10	500	0	70.3	62 - 128	338.4	3.87	20	
1,2-Dibromoethane	407	10	500	0	81.4	77 - 121	411	0.99	20	
1,2-Dichlorobenzene	381.1	10	500	0	76.2	80 - 119	387.6	1.69	20	S
1,2-Dichloroethane	418.5	10	500	0	83.7	73 - 128	402	4.03	20	
1,2-Dichloropropane	406.7	10	500	0	81.3	78 - 122	405.8	0.227	20	
1,3,5-Trimethylbenzene	446.4	10	500	0	89.3	75 - 124	458.9	2.77	20	
1,3-Dichlorobenzene	396.1	10	500	0	79.2	80 - 119	402.7	1.66	20	S
1,3-Dichloropropane	386.2	10	500	0	77.2	80 - 119	384.2	0.511	20	S
1,4-Dichlorobenzene	386.3	10	500	0	77.3	79 - 118	388.1	0.46	20	S
2,2-Dichloropropane	470.2	10	500	0	94.0	60 - 139	465.6	0.982	20	
2-Butanone	784.2	20	1000	0	78.4	56 - 143	734.4	6.57	20	
2-Chlorotoluene	435.4	10	500	0	87.1	79 - 122	450.7	3.45	20	
2-Hexanone	782.3	20	1000	0	78.2	57 - 139	729.4	7	20	
4-Chlorotoluene	435.7	10	500	0	87.1	78 - 122	445.5	2.23	20	
4-Isopropyltoluene	400.7	10	500	0	80.1	77 - 127	411.8	2.73	20	
4-Methyl-2-pentanone	766.4	20	1000	0	76.6	67 - 130	756.3	1.32	20	
Acetone	792.8	20	1000	0	79.3	39 - 160	811.6	2.34	20	
Benzene	418.6	10	500	0	83.7	79 - 120	430.7	2.85	20	
Bromobenzene	381.9	10	500	0	76.4	80 - 120	388.1	1.6	20	S
Bromochloromethane	456.6	10	500	0	91.3	78 - 123	454.9	0.363	20	
Bromodichloromethane	436.5	10	500	0	87.3	79 - 125	441.7	1.18	20	
Bromoform	440.1	10	500	0	88.0	66 - 130	438.8	0.307	20	
Bromomethane	409.5	10	500	0	81.9	53 - 141	415	1.34	20	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312577		Instrument: VOA2		Method: SW8260						
MSD	Sample ID: HS18030510-01MSD	Units: ug/L			Analysis Date: 15-Mar-2018 14:46					
Client ID:	Run ID: VOA2_312577	SeqNo: 4475731	PrepDate:	DF: 10						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	900.1	20	1000	0	90.0	64 - 133	905.3	0.578	20	
Carbon tetrachloride	494.8	10	500	0	99.0	72 - 136	491.3	0.71	20	
Chlorobenzene	413.4	10	500	0	82.7	80 - 120	418.2	1.14	20	
Chloroethane	368.8	10	500	0	73.8	82 - 118	392.5	6.24	20	S
Chloroform	407.2	10	500	0	81.4	79 - 124	413.5	1.54	20	
Chloromethane	424.4	10	500	0	84.9	50 - 139	449.7	5.79	20	
cis-1,2-Dichloroethene	448.1	10	500	0	89.6	78 - 123	446.5	0.362	20	
cis-1,3-Dichloropropene	458.1	10	500	0	91.6	75 - 124	453.4	1.04	20	
Dibromochloromethane	434.1	10	500	0	86.8	74 - 126	435.7	0.372	20	
Dibromomethane	434.7	10	500	0	86.9	79 - 123	431.1	0.827	20	
Dichlorodifluoromethane	419.5	10	500	0	83.9	32 - 152	441.2	5.04	20	
Ethylbenzene	465.9	10	500	0	93.2	79 - 121	489	4.85	20	
Hexachlorobutadiene	462.1	10	500	0	92.4	66 - 134	469.4	1.57	20	
Isopropylbenzene	431.7	10	500	0	86.3	72 - 131	443.1	2.61	20	
m,p-Xylene	834	20	1000	0	83.4	80 - 121	852.3	2.18	20	
Methylene chloride	396.9	20	500	0	79.4	74 - 124	409.5	3.11	20	
Naphthalene	419	10	500	0	83.8	61 - 128	407	2.9	20	
n-Butylbenzene	423.5	10	500	0	84.7	75 - 128	436.3	2.98	20	
n-Propylbenzene	398.2	10	500	0	79.6	76 - 126	405.9	1.91	20	
o-Xylene	418.5	10	500	0	83.7	78 - 122	423.5	1.18	20	
sec-Butylbenzene	419.9	10	500	0	84.0	77 - 126	430.2	2.43	20	
Styrene	403.3	10	500	0	80.7	78 - 128	408.4	1.25	20	
tert-Butylbenzene	404.6	10	500	0	80.9	78 - 124	417.2	3.06	20	
Tetrachloroethene	450.4	10	500	0	90.1	74 - 129	464.1	2.98	20	
Toluene	400.5	10	500	0	80.1	80 - 121	413.1	3.08	20	
trans-1,2-Dichloroethene	475	10	500	0	95.0	75 - 124	471.4	0.762	20	
trans-1,3-Dichloropropene	466.3	10	500	0	93.3	73 - 127	461.9	0.949	20	
Trichloroethene	467	10	500	0	93.4	79 - 123	477.2	2.17	20	
Trichlorofluoromethane	478.2	10	500	0	95.6	65 - 141	479.7	0.313	20	
Vinyl chloride	458.7	10	500	0	91.7	58 - 137	466.2	1.61	20	
Surr: 1,2-Dichloroethane-d4	431.3	10	500	0	86.3	81 - 118	436.7	1.24	20	
Surr: 4-Bromofluorobenzene	501.5	10	500	0	100	85 - 114	499.9	0.319	20	
Surr: Dibromofluoromethane	418.2	10	500	0	83.6	80 - 119	409.6	2.09	20	
Surr: Toluene-d8	500	10	500	0	100.0	89 - 112	506.9	1.38	20	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT****Batch ID:** R312577**Instrument:** VOA2**Method:** SW8260

The following samples were analyzed in this batch:

HS18030365-01

HS18030365-02

HS18030365-03

HS18030365-04

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID:	126467	Instrument:	UV-2450	Method:	E365.3					
<b>MBLK</b>	Sample ID: <b>MBLK-126467</b>		Units: <b>mg/L</b>		Analysis Date: <b>22-Mar-2018 14:17</b>					
Client ID:		Run ID: <b>UV-2450_312946</b>		SeqNo: <b>4484200</b>	PrepDate: <b>21-Mar-2018</b>	DF: <b>1</b>				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.0250	0.0500								U
<b>LCS</b>	Sample ID: <b>LCS-126467</b>		Units: <b>mg/L</b>		Analysis Date: <b>22-Mar-2018 14:17</b>					
Client ID:		Run ID: <b>UV-2450_312946</b>		SeqNo: <b>4484199</b>	PrepDate: <b>21-Mar-2018</b>	DF: <b>1</b>				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.244	0.0500	0.25	0	97.6	80 - 120				
<b>MS</b>	Sample ID: <b>HS18030917-01MS</b>		Units: <b>mg/L</b>		Analysis Date: <b>22-Mar-2018 14:17</b>					
Client ID:		Run ID: <b>UV-2450_312946</b>		SeqNo: <b>4484197</b>	PrepDate: <b>21-Mar-2018</b>	DF: <b>1</b>				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.345	0.0500	0.25	0.136	83.6	80 - 120				
<b>MSD</b>	Sample ID: <b>HS18030917-01MSD</b>		Units: <b>mg/L</b>		Analysis Date: <b>22-Mar-2018 14:17</b>					
Client ID:		Run ID: <b>UV-2450_312946</b>		SeqNo: <b>4484198</b>	PrepDate: <b>21-Mar-2018</b>	DF: <b>1</b>				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.352	0.0500	0.25	0.136	86.4	80 - 120	0.345	2.01	20	
The following samples were analyzed in this batch:										
HS18030365-01      HS18030365-02      HS18030365-03										

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID:	R312233	Instrument:	ManTech01	Method:	SM2320B					
<b>MBLK</b>	Sample ID: <b>WBLKW1-180308</b>	Units: <b>mg/L</b>	Analysis Date: <b>08-Mar-2018 20:29</b>							
Client ID:	Run ID: <b>ManTech01_312233</b>	SeqNo: <b>4467205</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Alkalinity, Total (As CaCO3)	5.00	5.00								U
<b>LCS</b>	Sample ID: <b>LCS1-180308</b>	Units: <b>mg/L</b>	Analysis Date: <b>08-Mar-2018 20:38</b>							
Client ID:	Run ID: <b>ManTech01_312233</b>	SeqNo: <b>4467206</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Alkalinity, Total (As CaCO3)	1087	5.00	1000	0	109	85 - 115				
<b>LCSD</b>	Sample ID: <b>LCSD1-180308</b>	Units: <b>mg/L</b>	Analysis Date: <b>08-Mar-2018 20:46</b>							
Client ID:	Run ID: <b>ManTech01_312233</b>	SeqNo: <b>4467207</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Alkalinity, Total (As CaCO3)	1097	5.00	1000	0	110	85 - 115	1087	0.902	20	
<b>DUP</b>	Sample ID: <b>HS18030295-06DUP</b>	Units: <b>mg/L</b>	Analysis Date: <b>08-Mar-2018 21:15</b>							
Client ID:	Run ID: <b>ManTech01_312233</b>	SeqNo: <b>4467212</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Alkalinity, Total (As CaCO3)	150.9	5.00					150.6	0.199	20	
The following samples were analyzed in this batch:										
HS18030365-01      HS18030365-02      HS18030365-03										

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

## QC BATCH REPORT

Batch ID: R312306		Instrument: ICS2100		Method: SW9056						
<b>MBLK</b>	Sample ID: <b>WBLKW1-030818</b>	Units: <b>mg/L</b>		Analysis Date: <b>09-Mar-2018 00:02</b>						
Client ID:	Run ID: <b>ICS2100_312306</b>	SeqNo: <b>4469079</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	0.250	0.500								U
Nitrogen, Nitrate (As N)	0.0500	0.100								U
Nitrogen, Nitrite (As N)	0.0500	0.100								U
Sulfate	0.250	0.500								U
<b>LCS</b>	Sample ID: <b>WLCSW1-030818</b>	Units: <b>mg/L</b>		Analysis Date: <b>09-Mar-2018 00:16</b>						
Client ID:	Run ID: <b>ICS2100_312306</b>	SeqNo: <b>4469080</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	20.53	0.500	20	0	103	80 - 120				
Nitrogen, Nitrate (As N)	4.153	0.100	4	0	104	80 - 120				
Nitrogen, Nitrite (As N)	4.287	0.100	4	0	107	80 - 120				
Sulfate	20.79	0.500	20	0	104	80 - 120				
<b>LCSD</b>	Sample ID: <b>WLCSDW1-030818</b>	Units: <b>mg/L</b>		Analysis Date: <b>09-Mar-2018 00:31</b>						
Client ID:	Run ID: <b>ICS2100_312306</b>	SeqNo: <b>4469081</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.97	0.500	20	0	99.9	80 - 120	20.53	2.77	20	
Nitrogen, Nitrate (As N)	4.126	0.100	4	0	103	80 - 120	4.153	0.652	20	
Nitrogen, Nitrite (As N)	4.233	0.100	4	0	106	80 - 120	4.287	1.27	20	
Sulfate	20.81	0.500	20	0	104	80 - 120	20.79	0.0673	20	
<b>MS</b>	Sample ID: <b>HS18030366-03MS</b>	Units: <b>mg/L</b>		Analysis Date: <b>09-Mar-2018 04:24</b>						
Client ID:	Run ID: <b>ICS2100_312306</b>	SeqNo: <b>4469095</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	61.04	0.500	10	49.24	118	80 - 120				O
Nitrogen, Nitrate (As N)	2.111	0.100	2	0	106	80 - 120				
Nitrogen, Nitrite (As N)	2.122	0.100	2	0.067	103	80 - 120				
Sulfate	51.89	0.500	10	40.12	118	80 - 120				O

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.

Project: LHAAP-58

WorkOrder: HS18030365

## QC BATCH REPORT

Batch ID: R312306		Instrument: ICS2100		Method: SW9056							
MSD	Sample ID: HS18030366-03MSD	Units: mg/L			Analysis Date: 09-Mar-2018 04:38						
Client ID:	Run ID: ICS2100_312306	SeqNo: 4469096		PrepDate:		DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Chloride	60.9	0.500	10	49.24	117	80 - 120	61.04	0.23	20	O	
Nitrogen, Nitrate (As N)	2.052	0.100	2	0	103	80 - 120	2.111	2.83	20		
Nitrogen, Nitrite (As N)	2.184	0.100	2	0.067	106	80 - 120	2.122	2.88	20		
Sulfate	51.71	0.500	10	40.12	116	80 - 120	51.89	0.349	20	O	

The following samples were analyzed in this batch: HS18030365-01 HS18030365-02 HS18030365-03

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID:	R312697	Instrument:	WetChem_HS	Method:	E376.1					
<b>MBLK</b>	Sample ID: <b>MBLK-312697</b>	Units: <b>mg/L</b>	Analysis Date: <b>13-Mar-2018 17:05</b>							
Client ID:	Run ID: <b>WetChem_HS_312697</b>	SeqNo: <b>4478369</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	1.00	1.00								U
<b>LCS</b>	Sample ID: <b>LCS-312697</b>	Units: <b>mg/L</b>	Analysis Date: <b>13-Mar-2018 17:05</b>							
Client ID:	Run ID: <b>WetChem_HS_312697</b>	SeqNo: <b>4478370</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	23.36	1.00	25	0	93.4	80 - 120				
<b>LCSD</b>	Sample ID: <b>LCSD-312697</b>	Units: <b>mg/L</b>	Analysis Date: <b>13-Mar-2018 17:05</b>							
Client ID:	Run ID: <b>WetChem_HS_312697</b>	SeqNo: <b>4478371</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	23.16	1.00	25	0	92.6	80 - 120	23.36	0.86	20	
<b>MS</b>	Sample ID: <b>HS18030365-03MS</b>	Units: <b>mg/L</b>	Analysis Date: <b>13-Mar-2018 17:05</b>							
Client ID: <b>35AWW11-030718</b>	Run ID: <b>WetChem_HS_312697</b>	SeqNo: <b>4478372</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	22.76	1.00	25	-0.44	92.8	80 - 120				
The following samples were analyzed in this batch:										
HS18030365-01      HS18030365-02      HS18030365-03										

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QC BATCH REPORT**

Batch ID: R312878		Instrument: TOC_02		Method: E415.1					
<b>MBLK</b>	Sample ID: <b>WBLKW1-032018</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 19:47</b>					
Client ID:	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482712</b>		PrepDate:		DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual	
Organic Carbon, Total	0.500	1.00						U	
<b>LCS</b>	Sample ID: <b>WLCSW1-032018</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 20:03</b>					
Client ID:	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482713</b>		PrepDate:		DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual	
Organic Carbon, Total	10.15	1.00	10	0	102	80 - 120			
<b>LCSD</b>	Sample ID: <b>WLCSDW1-032018</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 20:18</b>					
Client ID:	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482714</b>		PrepDate:		DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual	
Organic Carbon, Total	10.34	1.00	10	0	103	80 - 120	10.15	1.85 20	
<b>MS</b>	Sample ID: <b>HS18030472-05MS</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 23:17</b>					
Client ID:	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482726</b>		PrepDate:		DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual	
Organic Carbon, Total	10.7	1.00	10	1.447	92.5	80 - 120			
<b>The following samples were analyzed in this batch:</b>									
HS18030365-01			HS18030365-02			HS18030365-03			

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**ALS Group Houston, Corp**

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030365

**QUALIFIERS,  
ACRONYMS, UNITS**

<b>Qualifier</b>	<b>Description</b>
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

<b>Acronym</b>	<b>Description</b>
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

<b>Unit Reported</b>	<b>Description</b>
mg/L	Milligrams per Liter

**CERTIFICATIONS,ACCREDITATIONS & LICENSES**

<b>Agency</b>	<b>Number</b>	<b>Expire Date</b>
California	2919 2016-2018	31-Jul-2018
Illinois	004112	09-May-2018
Kentucky	123043	30-Apr-2018
Louisiana	03087 2017-2017	30-Jun-2018
North Dakota	R193 2017-2017	30-Apr-2018
Oklahoma	2017-088	31-Aug-2018
Texas	T104704231-17-19	30-Apr-2018
North Carolina	624-2018	31-Dec-2018

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**Work Order:** HS18030365

**SAMPLE TRACKING**

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	Sub
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	Sub
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	B040
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	MET008
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	MET008
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	Sub
HS18030365-01	35AWW20-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	Sub
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	Sub
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	B040
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	MET008
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	MET008
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	Sub
HS18030365-02	LHSMW07-030718	Login	3/8/2018 12:31:44 PM	JML	WET228
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	WET228
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	Sub
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	Sub
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	B040
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	MET008
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	MET008
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	WET228
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	WET228
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	Sub
HS18030365-03	35AWW11-030718	Login	3/8/2018 12:31:45 PM	JML	WET228
HS18030365-04	Trip Blank	Login	3/8/2018 12:31:45 PM	JML	B040

**Sample Receipt Checklist**

Client Name: Bhate Environmental  
 Work Order: HS18030365

Date/Time Received: **08-Mar-2018 09:30**  
 Received by: **RPG**

Checklist completed by: Paresh M. Giga      8-Mar-2018      Reviewed by: \_\_\_\_\_  
 eSignature      Date      eSignature      Date

Matrices: **Groundwater/Water**      Carrier name: **FedEx**

- Shipping container/cooler in good condition?      Yes       No       Not Present
- Custody seals intact on shipping container/cooler?      Yes       No       Not Present
- Custody seals intact on sample bottles?      Yes       No       Not Present
- Chain of custody present?      Yes       No
- Chain of custody signed when relinquished and received?      Yes       No
- Chain of custody agrees with sample labels?      Yes       No
- Samples in proper container/bottle?      Yes       No
- Sample containers intact?      Yes       No
- TX1005 solids received in hermetically sealed vials?      Yes       No       N/A
- Sufficient sample volume for indicated test?      Yes       No
- All samples received within holding time?      Yes       No
- Container/Temp Blank temperature in compliance?      Yes       No

Temperature(s)/Thermometer(s): 0.8c/1.2c U/c      IR30  
 Cooler(s)/Kit(s): 9221  
 Date/Time sample(s) sent to storage: 3/8/18 13:15

- Water - VOA vials have zero headspace?      Yes       No       No VOA vials submitted
- Water - pH acceptable upon receipt?      Yes       No       N/A
- pH adjusted?      Yes       No       N/A

pH adjusted by: \_\_\_\_\_

Login Notes: No CO2 neat vials received. Split into neat vials for CO2 analysis

Client Contacted: \_\_\_\_\_ Date Contacted: \_\_\_\_\_ Person Contacted: \_\_\_\_\_

Contacted By: \_\_\_\_\_ Regarding: \_\_\_\_\_

Comments: \_\_\_\_\_

Corrective Action: \_\_\_\_\_



1608 13th Avenue South, Suite 300  
Birmingham Alabama 35205  
Tel: 205-918-4000  
Fax: 205-918-4050

Page: \_\_\_\_\_ of \_\_\_\_\_

Project/Phase No: NW01312.0150

COC Number(1): \_\_\_\_\_

LIMS Number: \_\_\_\_\_

### Chain of Custody and Analytical Request

Facility/Base I.D.: LHAAP

Sample Analysis Requested <sup>(5)</sup>

Quality Assurance Samples <sup>(6)</sup>


Project/Site Name: LHAAP / Site 58

Client Name: \_\_\_\_\_

Collected by: Scott Beesinger

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (1)	Sample Number (2)	Sample Matrix (4)	Number of containers	VOC	TOC	MEE / CO2	Anions / Alkalinity	Sulfide	Phosphorous	Dissolved Mn & Fe	Total Mn & Fe	Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
35AWW20_030718		07 MAR 2018	1000	-	N		WG	12	X	X	X	X	X	X	X	X				
35AWW07_030718		07 MAR 2018	1110	-	N		WG	12	X	X	X	X	X	X	X	X				
35AWW11_030718		07 MAR 2018	1225	-	N		WG	12	X	X	X	X	X	X	X	X				
Trip Blank		07 MAR 2018			TB		W	2	X											

**HS18030365**  
Bhate Environmental Associates, Inc.  
LHAAP-58




COMMENTS: \_\_\_\_\_



Custody Transfers Prior to Receipt by Laboratory			
Relinquished By (Signed)	Date	Time	
1. <u>Scott Beesinger</u>	<u>3/7/18</u>	<u>1430</u>	
2. _____			
3. _____			

Sample Delivery Details / Laboratory Receipt			
Delivered Directly to Lab:	Shipped	No.:	
_____	_____	_____	
Method of Shipment: _____			
Fed	Ex	Airbill	Number: _____
_____	_____	_____	_____
Analytical Lab:	ALS 10450 Stancliff Rd, Suite 210 Houston, TX 77099 (281) 530-5656		
ATTN: SONIA WEST	Lab Recipient:	Delivery Date/Time:	

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)  
 2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)  
 3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)  
 4.) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks  
 5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.  
 6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment Blank Lot Control

 <b>ALS</b> 10450 Stancliff Rd., Suite 210 Houston, Texas 77099 Tel. +1 281 530 5656 Fax. +1 281 530 5887	<b>CUSTODY SEAL</b>		Seal Broken By:
	Date: 3/7/18	Time: 1430	SM
	Name: Scott Bergin	Company: B. H. A. T. T.	Date: 03/08/18

9221 MAR 08 2018

 TRACK 0221 7376 9752 7543	THU - 08 MAR 10:30A PRIORITY OVERNIGHT
<b>AB SGRA</b>	9221 77099 TX-US IAH
	
<small>FID 162785 07MAR18 06GA 546C1/07F5/0C0A</small>	



---

2655 Park Center Dr., Suite A  
Simi Valley, CA 93065  
T: +1 805 526 7161  
F: +1 805 526 7270  
[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

March 29, 2018

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road Suite 210  
Houston, TX 77099-4338

**RE: HS18030365**

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on March 9, 2018. For your reference, these analyses have been assigned our service request number P1801149.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kelly Horiuchi at 3:18 pm, Mar 29, 2018

Kelly Horiuchi  
Laboratory Director



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[www.alsglobal.com](http://www.alsglobal.com)

Client: ALS Laboratory Group  
 Project: HS18030365

Service Request No: P1801149

## CASE NARRATIVE

The samples were received intact under chain of custody on March 9, 2018 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Carbon Dioxide Analysis

Three of the samples were analyzed for carbon dioxide using a gas chromatograph equipped with a thermal conductivity detector (TCD). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least four hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (carbon dioxide) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175 as described in laboratory SOP VOA-DISGAS. This analyte is included on the laboratory's NELAP and DoD-ELAP scope of accreditation.

### Methane, Ethene and Ethane Analysis

The other three samples were analyzed for methane, ethene and ethane using a gas chromatograph equipped with a flame ionization detector (FID). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least two hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (methane, ethene and ethane) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP accreditation.

*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	<a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a>	AZ0694
Florida DOH (NELAP)	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E871020
Louisiana DEQ (NELAP)	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	05071
Maine DHHS	<a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>	2016036
Minnesota DOH (NELAP)	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	1347317
New Jersey DEP (NELAP)	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	CA009
New York DOH (NELAP)	<a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>	11221
Oregon PHD (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	4068-005
Pennsylvania DEP	<a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>	68-03307 (Registration)
PJLA (DoD ELAP)	<a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>	65818 (Testing)
Texas CEQ (NELAP)	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704413-17-8
Utah DOH (NELAP)	<a href="http://health.utah.gov/lab/environmental-lab-certification/">http://health.utah.gov/lab/environmental-lab-certification/</a>	CA01627201 7-8
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

## ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: ALS Laboratory Group  
 Project ID: HS18030365

Service Request: P1801149

Date Received: 3/9/2018  
 Time Received: 09:15

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected		
					RSK 175 - Gases	RSK 175 - CO2
35AWW20-030718	P1801149-001	Water	3/7/2018	10:00	X	
35AWW20-030718	P1801149-002	Water	3/7/2018	10:00		X
LHSMW07-030718	P1801149-003	Water	3/7/2018	11:10	X	
LHSMW07-030718	P1801149-004	Water	3/7/2018	11:10		X
35AWW11-030718	P1801149-005	Water	3/7/2018	12:25	X	
35AWW11-030718	P1801149-006	Water	3/7/2018	12:25		X

P1801149



10450 Stancliff Rd, Ste 210  
Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887  
www.alsglobal.com

### Subcontract Chain of Custody

COC ID: 8725

**SUBCONTRACT TO:**

ALS Environmental  
2655 Park Center Drive, Suite A  
Simi Valley, CA 93065

Phone: +1 805 526 7161

**CUSTOMER INFORMATION:**

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate Contact:**  
**Email:**

**INVOICE INFORMATION:**

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** HS18030365  
**TSR:** Danielle Winnings

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	HS18030365-01	35AWW20-030718	Groundwater	07 Mar 2018 10:00
	MEE plus CO2 Sub to ALS SimiValley			22 Mar 2018
2.	HS18030365-02	LHSMW07-030718	Groundwater	07 Mar 2018 11:10
	MEE plus CO2 Sub to ALS SimiValley			22 Mar 2018
3.	HS18030365-03	35AWW11-030718	Groundwater	07 Mar 2018 12:25
	MEE plus CO2 Sub to ALS SimiValley			22 Mar 2018

**Comments:** Please analyze for the analysis listed above.  
Send report to the emails shown above. HCL vials for MEE. Neat Vials for CO2

**QC Level:** DOD IV (DoD Data Package)

Relinquished By: J. V. M. K. A. N.

Date/Time: 3/8/18 18:00

Received By: [Signature]

Date/Time: 3-9-18 09:15 20 NIT 105

Cooler ID(s): [Signature]

Temperature(s): \_\_\_\_\_

**ALS Environmental  
Sample Acceptance Check Form**

Client: ALS Laboratory Group Work order: P1801149  
 Project: HS18030365  
 Sample(s) received on: 3/9/18 Date opened: 3/9/18 by: ADAVID

*Note:* This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |    |   | <b>Yes</b>                          | <b>No</b>                | <b>N/A</b>                          |
|----|---|-------------------------------------|--------------------------|-------------------------------------|
| 1  | Were <b>sample containers</b> properly marked with client sample ID?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 2  | Did <b>sample containers</b> arrive in good condition?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 3  | Were <b>chain-of-custody</b> papers used and filled out?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 4  | Did <b>sample container labels</b> and/or tags agree with custody papers?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 5  | Was <b>sample volume</b> received adequate for analysis?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 6  | Are samples within specified holding times?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 7  | Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?<br>Cooler Temperature: ° C    Blank Temperature: 2° C   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
|    | <b>Wet Ice</b>  |                                     |                          |                                     |
| 8  | Were <b>custody seals</b> on outside of cooler/Box/Container?<br>Location of seal(s)? _____ Sealing Lid?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
|    | Were signature and date included?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
|    | Were seals intact?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 9  | Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information?<br>Is there a client indication that the submitted samples are <b>pH</b> preserved?<br>Were <b>VOA vials</b> checked for presence/absence of air bubbles? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
|    | Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?   | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 10 | <b>Tubes:</b> Are the tubes capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 11 | <b>Badges:</b> Are the badges properly capped and intact?<br>Are dual bed badges separated and individually capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1801149-001.01	40ml VOA HCL		1		A	MC 3/14/2018
P1801149-001.02	40ml VOA HCL				A	
P1801149-002.01	40mL VOA NP		7		A	MC 3/13/2018
P1801149-002.02	40mL VOA NP				A	
P1801149-003.01	40ml VOA HCL		1		A	MC 3/14/2018
P1801149-003.02	40ml VOA HCL				A	
P1801149-004.01	40mL VOA NP		7		A	MC 3/13/2018
P1801149-004.02	40mL VOA NP				A	
P1801149-005.01	40ml VOA HCL		1		A	MC 3/14/2018
P1801149-005.02	40ml VOA HCL				A	
P1801149-006.01	40mL VOA NP		7		A	MC 3/13/2018
P1801149-006.02	40mL VOA NP				A	

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Project ID:** HS18030365

ALS Project ID: P1801149

## Carbon Dioxide

Test Code: RSK 175  
Instrument ID: HP5890A/GC10/TCD  
Analyst: Mike Conejo  
Matrix: Water  
Test Notes:

Date(s) Collected: 3/7/18  
Date Received: 3/9/18  
Date Analyzed: 3/13/18

Client Sample ID	ALS Sample ID	Injection Volume ml(s)	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
35AWW20-030718	P1801149-002	0.10	<b>370,000</b>	1,000	760	370	
LHSMW07-030718	P1801149-004	0.10	<b>350,000</b>	1,000	760	370	
35AWW11-030718	P1801149-006	0.10	<b>360,000</b>	1,000	760	370	
Method Control Sample	P180313-MB	0.10	760	1,000	760	370	<b>U</b>

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS18030365

ALS Project ID: P1801149  
 ALS Sample ID: P180313-DLCS

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/TCD  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 3/13/18  
 Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount		Result <sub>i</sub>		% Recovery		DOD		Data Qualifier
		LCS / DLCS	LCS	DLCS	LCS	DLCS	Acceptance	RPD	RPD	
		ug/L	ug/L	ug/L	LCS	DLCS	Limits		Limit	
124-38-9	Carbon Dioxide	22,900	20,400	21,300	89	93	80-122	4	15	

<sub>i</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 35AWW20-030718  
**Client Project ID:** HS18030365

ALS Project ID: P1801149  
 ALS Sample ID: P1801149-001

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/7/18  
 Date Received: 3/9/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** LHSMW07-030718  
**Client Project ID:** HS18030365

ALS Project ID: P1801149  
 ALS Sample ID: P1801149-003

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/7/18  
 Date Received: 3/9/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	3.0	1.3	1.0	0.51	
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 35AWW11-030718  
**Client Project ID:** HS18030365

ALS Project ID: P1801149  
 ALS Sample ID: P1801149-005

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/7/18  
 Date Received: 3/9/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	16	1.3	1.0	0.51	
74-85-1	Ethene	0.38	1.0	0.55	0.24	J
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Method Control Sample  
**Client Project ID:** HS18030365

ALS Project ID: P1801149  
 ALS Sample ID: P180314-MB

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS18030365

ALS Project ID: P1801149  
 ALS Sample ID: P180314-LCS  
 P180314-DLCS

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Spike Amount	Result <sub>1</sub>		% Recovery		DOD	RPD	RPD	Data
		LCS / DLCS µg/L	LCS µg/L	DLCS µg/L	LCS	DLCS	Acceptance Limits			
74-82-8	Methane	2.50	2.31	2.33	<b>92</b>	<b>93</b>	73-125	1	12	
74-85-1	Ethene	4.37	4.82	4.84	<b>110</b>	<b>111</b>	72-133	0.9	7	
74-84-0	Ethane	4.69	4.70	4.81	<b>100</b>	<b>103</b>	74-131	3	6	

<sub>1</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.



March 26, 2018

Service Request No:R1802037

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road  
Suite 210  
Houston, TX 77099-4338

**Laboratory Results for: LHAAP / Site 58 HS18030365**

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory March 08, 2018  
For your reference, these analyses have been assigned our service request number **R1802037**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at [Janice.Jaeger@alsglobal.com](mailto:Janice.Jaeger@alsglobal.com).

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

Janice Jaeger  
Project Manager

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dba ALS Environmental




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## Narrative Documents

**ALS Environmental—Rochester Laboratory**  
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)



**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Received:** 03/08/2018

**CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV, validation deliverables including all summary forms and associated raw data. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

**Sample Receipt:**

Three water samples were received for analysis at ALS Environmental on 03/08/2018. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

**Semivoa GC:**

Method Organic Acids, 03/14/2018: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

Method Organic Acids, 03/14/2018: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.

**General Chemistry:**

Ferrous Iron was analyzed upon receipt in the laboratory.

Approved by \_\_\_\_\_

Date 03/26/2018



## SAMPLE DETECTION SUMMARY

CLIENT ID: 35AWW20_030718		Lab ID: R1802037-001					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	0.69		0.03	0.10	mg/L	SM 3500-Fe B.4.c	

CLIENT ID: LHSMW07_030718		Lab ID: R1802037-002					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	0.07	J	0.03	0.10	mg/L	SM 3500-Fe B.4.c	

CLIENT ID: 35AWW11_030718		Lab ID: R1802037-003					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	0.10	J	0.03	0.10	mg/L	SM 3500-Fe B.4.c	



## Sample Receipt Information

**ALS Environmental—Rochester Laboratory**  
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150

**Service Request:**R1802037

**SAMPLE CROSS-REFERENCE**

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1802037-001	35AWW20_030718	3/7/2018	1000
R1802037-002	LHSMW07_030718	3/7/2018	1110
R1802037-003	35AWW11_030718	3/7/2018	1225





# Cooler Receipt and Preservation Check Form

R1802037

5

ALS Group USA, Corp.  
LHAAP / Site 58

Project/Client Bhate Environmental Folder Number RR-Z037



Cooler received on 3-8-18 by: HE

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were <b>Custody seals</b> on outside of cooler?	<input checked="" type="radio"/> Y	<input type="radio"/> N
2	<b>Custody papers</b> properly completed (ink, signed)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
3	Did all bottles arrive in good <b>condition</b> (unbroken)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
4	Circle: <u>Wet Ice</u> <b>Dry Ice</b> <b>Gel packs</b> present?	<input checked="" type="radio"/> Y	<input type="radio"/> N

5a	<b>Perchlorate</b> samples have required headspace?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
5b	Did VOA vials, Alk, or Sulfide have sig* <b>bubbles</b> ?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
6	Where did the bottles originate?	<u>ALS/ROC</u>	<u>CLIENT</u>	
7	Soil VOA received as: Bulk Encore 5035set			<input checked="" type="radio"/> NA

8. Temperature Readings Date: 3-8-18 Time: 10:35 ID: IR#7 IR#9 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>1.4</u>							
Correction Factor (°C)	<u>0</u>							
Corrected Temp (°C)	<u>1.4</u>							
Temp from: Type of bottle	<u>-</u>							
Within 0-6°C?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N
If <0°C, were samples frozen?	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N

If out of Temperature, note packing/ice condition: \_\_\_\_\_ Ice melted Poorly Packed (described below) Same Day Rule  
& Client Approval to Run Samples: \_\_\_\_\_ Standing Approval Client aware at drop-off Client notified by: \_\_\_\_\_

All samples held in storage location: R-002 by HE on 3-8-18 at 10:38  
5035 samples placed in storage location: \_\_\_\_\_ by \_\_\_\_\_ on \_\_\_\_\_ at \_\_\_\_\_

Cooler Breakdown: Date: 3/8/18 Time: 1710 by: dlw

- 9. Were all bottle labels complete (i.e. analysis, preservation, etc.)?  YES  NO
- 10. Did all bottle labels and tags agree with custody papers?  YES  NO
- 11. Were correct containers used for the tests indicated?  YES  NO
- 12. Were 5035 vials acceptable (no extra labels, not leaking)?  YES  NO
- 13. Air Samples: Cassettes / Tubes Intact \_\_\_\_\_ Canisters Pressurized \_\_\_\_\_ Tedlar® Bags Inflated  N/A

pH	Lot of test paper	Reagent	Preserved?		Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
			Yes	No						
≥12		NaOH								
≤2		HNO <sub>3</sub>								
≤2		H <sub>2</sub> SO <sub>4</sub>								
<4		NaHSO <sub>4</sub>								
Residual Chlorine (-)		For CN Phenol and 522			If +, contact PM to add Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (CN), ascorbic (phenol).					
		Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	-	-						
		ZnAcetate	-	-						
		HCl	**	**						

\*\*Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: 10167-134C

Explain all Discrepancies/ Other Comments:

CLRES	BULK
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

Labels secondary reviewed by: sh  
PC Secondary Review: dlw 3/9/18

\*significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter

Internal Chain of Custody Report

**Client:** ALS Laboratory Group  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150

**Service Request:** R1802037

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
<b>R1802037-001.01</b>					
	SM 3500-Fe B.4.c	3/8/2018	1730	SMO / DWARD	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<b>R1802037-001.02</b>					
	Organic Acids	3/8/2018	1730	SMO / DWARD	
		3/8/2018	1730	R-002 / DWARD	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	
<b>R1802037-002.01</b>					
	SM 3500-Fe B.4.c	3/8/2018	1730	SMO / DWARD	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<b>R1802037-002.02</b>					
	Organic Acids	3/8/2018	1730	SMO / DWARD	
		3/8/2018	1730	R-002 / DWARD	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	
<b>R1802037-003.01</b>					
	SM 3500-Fe B.4.c	3/8/2018	1730	SMO / DWARD	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<b>R1802037-003.02</b>					
	Organic Acids	3/8/2018	1730	SMO / DWARD	
		3/8/2018	1730	R-002 / DWARD	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	



## Miscellaneous Forms

**ALS Environmental—Rochester Laboratory**  
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Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)

## REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration &gt;40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the "Notes" column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an "immediate" hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is &lt;0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is &lt;50% of the spike absorbance.</p> <p>P Concentration &gt;40% difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed (<math>\times 100\%</math> Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
--	---



### Rochester Lab ID # for State Certifications<sup>1</sup>

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Approved	New Jersey ID # NY004	294100 A/B
DoD ELAP #65817	New York ID # 10145	Pennsylvania ID# 68-786
Florida ID # E87674	North Carolina #676	Rhode Island ID # 158
		Virginia #460167

<sup>1</sup> Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental>

## ALS Laboratory Group

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### Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Analyst Summary report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150

**Service Request:** R1802037

**Sample Name:** 35AWW20\_030718  
**Lab Code:** R1802037-001  
**Sample Matrix:** Water

**Date Collected:** 03/7/18  
**Date Received:** 03/8/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON

**Sample Name:** LHSMW07\_030718  
**Lab Code:** R1802037-002  
**Sample Matrix:** Water

**Date Collected:** 03/7/18  
**Date Received:** 03/8/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON

**Sample Name:** 35AWW11\_030718  
**Lab Code:** R1802037-003  
**Sample Matrix:** Water

**Date Collected:** 03/7/18  
**Date Received:** 03/8/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON



## INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

### Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

### Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



# Sample Results

**ALS Environmental—Rochester Laboratory**  
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)



## Semivolatile Organic Compounds by GC

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1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Collected:** 03/07/18 10:00  
**Date Received:** 03/08/18 10:05

**Sample Name:** 35AWW20\_030718  
**Lab Code:** R1802037-001

**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 16:39	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 16:39	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 16:39	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 16:39	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 16:39	

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water  
**Sample Name:** LHSMW07\_030718  
**Lab Code:** R1802037-002

**Service Request:** R1802037  
**Date Collected:** 03/07/18 11:10  
**Date Received:** 03/08/18 10:05  
**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 17:17	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 17:17	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 17:17	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 17:17	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 17:17	

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Collected:** 03/07/18 12:25  
**Date Received:** 03/08/18 10:05

**Sample Name:** 35AWW11\_030718  
**Lab Code:** R1802037-003

**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 17:52	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 17:52	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 17:52	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 17:52	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 17:52	



## General Chemistry

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Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW20\_030718  
**Lab Code:** R1802037-001

**Service Request:** R1802037  
**Date Collected:** 03/07/18 10:00  
**Date Received:** 03/08/18 10:05  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	<b>0.69</b>	mg/L	0.10	0.08	0.03	1	03/08/18 16:32	*

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water  
**Sample Name:** LHSMW07\_030718  
**Lab Code:** R1802037-002

**Service Request:** R1802037  
**Date Collected:** 03/07/18 11:10  
**Date Received:** 03/08/18 10:05  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	<b>0.07 J</b>	mg/L	0.10	0.08	0.03	1	03/08/18 16:32	*

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW11\_030718  
**Lab Code:** R1802037-003

**Service Request:** R1802037  
**Date Collected:** 03/07/18 12:25  
**Date Received:** 03/08/18 10:05

**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	<b>0.10 J</b>	mg/L	0.10	0.08	0.03	1	03/08/18 16:32	*



## QC Summary Forms

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## Semivolatile Organic Compounds by GC

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[www.alsglobal.com](http://www.alsglobal.com)

ALS Group USA, Corp.  
dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Analyzed:** 03/14/18 14:45

**Method Blank Summary**

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Sample Name:** Method Blank **Instrument ID:** R-HPLC-05  
**Lab Code:** RQ1802335-01 **File ID:** I:\ACQUADATA\hplc05\data\031418\A0001466.D\  
**Analysis Method:** Organic Acids **Analysis Lot:** 583688

This Method Blank applies to the following analyses.

<b>Sample Name</b>	<b>Lab Code</b>	<b>File ID</b>	<b>Date Analyzed</b>
Lab Control Sample	RQ1802335-02	I:\ACQUADATA\hplc05\data\031418\A0001467.D\	03/14/18 15:20
Duplicate Lab Control Sample	RQ1802335-03	I:\ACQUADATA\hplc05\data\031418\A0001468.D\	03/14/18 16:01
35AWW20_030718	R1802037-001	I:\ACQUADATA\hplc05\data\031418\A0001469.D\	03/14/18 16:39
LHSMW07_030718	R1802037-002	I:\ACQUADATA\hplc05\data\031418\A0001470.D\	03/14/18 17:17
35AWW11_030718	R1802037-003	I:\ACQUADATA\hplc05\data\031418\A0001471.D\	03/14/18 17:52

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Collected:** NA  
**Date Received:** NA

**Sample Name:** Method Blank  
**Lab Code:** RQ1802335-01

**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 14:45	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 14:45	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 14:45	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 14:45	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 14:45	

ALS Group USA, Corp.  
dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Analyzed:** 03/14/18 15:20

**Lab Control Sample Summary****Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Sample Name:** Lab Control Sample      **Instrument ID:** R-HPLC-05  
**Lab Code:** RQ1802335-02      **File ID:** I:\ACQUADATA\hplc05\data\031418\A0001467.D\  
**Analysis Method:** Organic Acids      **Analysis Lot:** 583688

This Lab Control Sample applies to the following analyses.

<b>Sample Name</b>	<b>Lab Code</b>	<b>File ID</b>	<b>Date Analyzed</b>
Method Blank	RQ1802335-01	I:\ACQUADATA\hplc05\data\031418\A0001466.D\	03/14/18 14:45
Duplicate Lab Control Sample	RQ1802335-03	I:\ACQUADATA\hplc05\data\031418\A0001468.D\	03/14/18 16:01
35AWW20_030718	R1802037-001	I:\ACQUADATA\hplc05\data\031418\A0001469.D\	03/14/18 16:39
LHSMW07_030718	R1802037-002	I:\ACQUADATA\hplc05\data\031418\A0001470.D\	03/14/18 17:17
35AWW11_030718	R1802037-003	I:\ACQUADATA\hplc05\data\031418\A0001471.D\	03/14/18 17:52

ALS Group USA, Corp.  
dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Analyzed:** 03/14/18

**Duplicate Lab Control Sample Summary**  
**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

Units:mg/L

Basis:NA

Analyte Name	Analytical Method	Lab Control Sample RQ1802335-02			Duplicate Lab Control Sample RQ1802335-03			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Pyruvic Acid	Organic Acids	1.98	2.04	97	1.98	2.04	97	70-130	<1	30
Acetic Acid	Organic Acids	19.8	20.0	99	19.8	20.0	99	70-130	<1	30
Butanoic Acid (Butyric Acid)	Organic Acids	20.8	20.1	104	20.6	20.1	103	70-130	<1	30
Lactic Acid	Organic Acids	18.6	20.0	93	18.6	20.0	93	70-130	<1	30
Propionic Acid	Organic Acids	30.6	20.0	153 *	30.3	20.0	151 *	70-130	<1	30



## General Chemistry

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Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water  
**Sample Name:** Method Blank  
**Lab Code:** R1802037-MB

**Service Request:** R1802037  
**Date Collected:** NA  
**Date Received:** NA  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	ND U	mg/L	0.10	0.08	0.03	1	03/08/18 16:32	

ALS Group USA, Corp.  
dba ALS Environmental

## QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Collected:** 03/07/18  
**Date Received:** 03/08/18  
**Date Analyzed:** 03/8/18

**Duplicate Matrix Spike Summary**  
**Iron, Divalent (Ferrous Iron)**

**Sample Name:** LHSMW07\_030718  
**Lab Code:** R1802037-002  
**Analysis Method:** SM 3500-Fe B.4.c

**Units:** mg/L  
**Basis:** NA

Analyte Name	Sample Result	Matrix Spike R1802037-002MS			Duplicate Matrix Spike R1802037-002DMS			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Iron, Divalent (Ferrous Iron)	0.07 J	0.74	0.40	167 *	0.72	0.40	162 *	67-129	3	20

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150  
**Sample Matrix:** Water

**Service Request:** R1802037  
**Date Analyzed:** 03/08/18

**Lab Control Sample Summary**  
**General Chemistry Parameters**

**Units:**mg/L  
**Basis:**NA

**Lab Control Sample**  
R1802037-LCS

<u>Analyte Name</u>	<u>Analytical Method</u>	<u>Result</u>	<u>Spike Amount</u>	<u>% Rec</u>	<u>% Rec Limits</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	0.418	0.40	105	67-129

ALS Group USA, Corp.  
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QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150

**Service Request:**R1802037

**Continuing Calibration Blank (CCB) Summary**  
**Iron, Divalent (Ferrous Iron)**

**Analysis Method:** SM 3500-Fe B.4.c

**Units:**mg/L

	<b>Analysis Lot</b>	<b>Lab Code</b>	<b>Date Analyzed</b>	<b>LOQ</b>	<b>LOD</b>	<b>MDL</b>	<b>Result</b>	<b>Q</b>
CCB1	584246	RQ1802611-02	03/08/18 16:32	0.10	0.08	0.03	ND	U
CCB2	584246	RQ1802611-05	03/08/18 16:32	0.10	0.08	0.03	ND	U

**Client:** ALS Environmental - US  
**Project:** LHAAP / Site 58 HS18030365/NW01312.0150

**Service Request:** R1802037

### Continuing Calibration Verification (CCV) Summary

#### Iron, Divalent (Ferrous Iron)

**Analysis Method:** SM 3500-Fe B.4.c

**Units:** mg/L

	Analysis		Date	True	Measured	Percent	Acceptance
	Lot	Lab Code	Analyzed	Value	Value	Recovery	Limits
CCV1	584246	RQ1802611-01	03/08/18 16:32	2.00	2.09	105	90-110
CCV2	584246	RQ1802611-06	03/08/18 16:32	2.00	2.08	104	90-110



10515 Research Drive  
Knoxville, TN 37932  
Phone: (865) 573-8188  
Fax: (865) 573-8133

---

**Client:** RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Rd  
Suite 210  
Houston, TX 77040

**Phone:** 281-575-2279

**Fax:**

**Identifier:** 035PC

**Date Rec:** 03/08/2018

**Report Date:** 03/14/2018

**Client Project #:** NWD1312.0150

**Client Project Name:** LHAAP-58

**Purchase Order #:** HS18030365

**Analysis Requested:** CENSUS

**Reviewed By:**

A handwritten signature in black ink, appearing to read 'Joan Spence', written over a horizontal line.

---

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**MICROBIAL INSIGHTS, INC.**

10515 Research Dr., Knoxville, TN 37932  
 Tel. (865) 573-8188 Fax. (865) 573-8133

**CENSUS**

**Client:** ALS Laboratory Group  
**Project:** LHAAP-58

**MI Project Number:** 035PC  
**Date Received:** 03/08/2018

**Sample Information**

Client Sample ID:	35AWW20_0307	LHSMW07_030	35AWW11_030
	18	718	718
Sample Date:	03/07/2018	03/07/2018	03/07/2018
Units:	cells/mL	cells/mL	cells/mL
Analyst/Reviewer:	JS	JS	JS

**Dechlorinating Bacteria**

<i>Dehalococcoides</i>	<i>DHC</i>	5.50E+00	1.18E+01	6.00E-01
tceA Reductase	TCE	<5.00E-01	<5.00E-01	<5.00E-01
BAV1 Vinyl Chloride Reductase	BVC	<5.00E-01	<5.00E-01	<5.00E-01
Vinyl Chloride Reductase	VCR	<5.00E-01	<5.00E-01	<5.00E-01
<i>Dehalobacter spp.</i>	<i>DHBt</i>	1.12E+03	<4.80E+00	<5.00E+00

**Legend:**

NA = Not Analyzed    NS = Not Sampled    J = Estimated gene copies below PQL but above LQL    I = Inhibited  
 < = Result not detected

## Quality Assurance/Quality Control Data

Samples Received 3/8/2018

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
BVC	03/08/2018	03/14/2018	0 °C	102%	non-detect	non-detect
TCE	03/08/2018	03/14/2018	0 °C	101%	non-detect	non-detect
VCR	03/08/2018	03/14/2018	0 °C	103%	non-detect	non-detect
DHBt	03/08/2018	03/14/2018	0 °C	106%	non-detect	non-detect
DHC	03/08/2018	03/14/2018	0 °C	104%	non-detect	non-detect

REPORT TO:

Name: MARCIA OLIVE  
 Company: BHATE  
 Address: 445 UNION BLVD. STE 129  
LAKWOOD, CO. 80228  
 email: molive@bhate.com  
 Phone: 205-918-4000  
 Fax: \_\_\_\_\_

Project Manager: Kim Nemmers  
 Project Name: LHAAP-58  
 Project No.: NW01312.0150

INVOICE TO: (For Invoices paid by a third party it is imperative that all information be provided)

Name: \_\_\_\_\_  
 Company: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 email: \_\_\_\_\_  
 Phone: \_\_\_\_\_  
 Fax: \_\_\_\_\_

Purchase Order No. \_\_\_\_\_  
 Subcontract No. \_\_\_\_\_  
 MI Quote No. \_\_\_\_\_



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 865-573-8188  
 www.microbe.com

Please Check One:

- More samples to follow
- No Additional Samples

Report Type:  Standard (default)  Microbial Insights Level III raw data(15% surcharge)  Microbial Insights Level IV (25% surcharge)  Comprehensive Interpretive(15%)  Historical Interpretive (30%)

EDD type:  Microbial Insights Standard (default)  All other available EDDs (5% surcharge) Specify EDD Type: \_\_\_\_\_

Please contact us with any questions about the analyses or filling out the COC at (865) 573-8188 (9:00 am to 5:00 pm EST, M-F). After hours email: customerservice@microbe.com

Sample Information					Analyses				CENSUS: Please select the target organism/gene																											
MI ID (Laboratory Use Only)	Sample Name	Date Sampled	Time Sampled	Matrix	PLFA	DGGE+3ID	DGGE+5ID	QuantArray Chlor	QuantArray Petro	DHC (Dehalococoides)	DHC Functional genes (bvc, bsr, vcr)	DHB (Dehalobacter)	DSM (Desulfuromonas)	DSB (Desulfibacterium)	EBAC (Total)	SRB	Sulfate Reducing Bacteria-APS	MGN (Methanogens)	MOB (Methanotrophs)	SMMO	DNF (Denitrifiers-nitS and nitK)	AOB (ammonia oxidizing bacteria)	PM1 (MTBE aerobic)	RMO (Toluene Monooxygenase)	RDEG (Toluene Monooxygenase)	PHE (Phenol Hydroxylase)	NAH (Naphthalene-aerobic)	BSSA (Toluene/Xylene-Anaerobic)	add. qPCR:	add. qPCR:	RNA (Expression Option)*	Other:	Other:	Other:		
035PC1	35AWW20_030718	3/7/18	1000	W						<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>																								
2	LHSMW07_030718	3/7/18	1110	W						<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>																								
3	35AWW11_030718	3/7/18	1225	W						<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>																								
Relinquished by: <u>Sarah Bussing</u>					Received by: <u>[Signature]</u>					Date: <u>3/8/18 9:44</u>																										

It is vital that chain of custody is filled out correctly & that all relative information is provided.  
 Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable.



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10450 Stancliff Rd. Suite 210  
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March 30, 2018

Marcia Olive  
Bhate Environmental Associates, Inc.  
445 Union Blvd Ste 129  
Lakewood, CO 80228

Work Order: **HS18030472**

Laboratory Results for: **LHAAP-58**

Dear Marcia,

ALS Environmental received 6 sample(s) on Mar 09, 2018 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DAYNA.FISHER  
RJ Modashia  
Project Manager

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**Work Order:** HS18030472

**SAMPLE SUMMARY**

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18030472-01	35AWW19_030818	Water		08-Mar-2018 08:15	09-Mar-2018 08:50	<input type="checkbox"/>
HS18030472-02	35AWW06_030818	Water		08-Mar-2018 09:30	09-Mar-2018 08:50	<input type="checkbox"/>
HS18030472-03	35AWW06_030818_a	Water		08-Mar-2018 09:30	09-Mar-2018 08:50	<input type="checkbox"/>
HS18030472-04	35AWW23_030818	Water		08-Mar-2018 11:00	09-Mar-2018 08:50	<input type="checkbox"/>
HS18030472-05	35AWW24_030818	Water		08-Mar-2018 12:10	09-Mar-2018 08:50	<input type="checkbox"/>
HS18030472-06	Trip Blank	Water	ALS- 021518-48	08-Mar-2018 00:00	09-Mar-2018 08:50	<input type="checkbox"/>

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**Work Order:** HS18030472

**CASE NARRATIVE****Work Order Comments**

- The analyses for DHC/DHB were subcontracted to Microbial Insights in Knoxville, TN. Final Report attached.
- The analyses for Ferrous Iron and Volatile Fatty Acids were subcontracted to ALS Environmental in Rochester, NY. Final Report attached.
- The analyses for RSK-175 Dissolved Gases and CO2 were subcontracted to ALS Environmental in Simi Valley, CA. Final Report attached.

**GCMS Volatiles by Method SW8260****Batch ID: R312915**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**Batch ID: R312659****Sample ID: 35AWW19\_030818 (HS18030472-01MS)**

- MS and/or MSD recovered outside control limits for multiple compounds

**Metals by Method SW6020****Batch ID: 126134****Sample ID: HS18030365-01MS**

- MS and MSD are for an unrelated sample

**Batch ID: 126131****Sample ID: 35AWW06\_030818 (HS18030472-02MSD)**

- Manganese failed on the MSD but passed on the MS and PDS.

**WetChemistry by Method E415.1****Batch ID: R312878**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**WetChemistry by Method SW9056****Batch ID: R312607****Sample ID: 35AWW24\_030818 (HS18030472-05MS)**

- The MS and/or MSD recovery was outside of the control limits; however, the result in the parent sample is greater than 4x the spike amount. (Chloride,Sulfate)

**Sample ID: CCB**

- All reported samples bracketed by this CCB are 10 times greater than the Chloride and Sulfate content in this CCB.

**WetChemistry by Method E376.1****Batch ID: R312695**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**ALS Group Houston, Corp**

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.**CASE NARRATIVE****Project:** LHAAP-58**Work Order:** HS18030472

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**WetChemistry by Method SM2320B****Batch ID: R312300**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

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**WetChemistry by Method E365.3****Batch ID: 126467**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.
-

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW19\_030818  
 Collection Date: 08-Mar-2018 08:15

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-01  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						
								Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
<b>1,1-Dichloroethene</b>	<b>9.0</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 15:09
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 15:09
<b>1,2-Dichloroethane</b>	<b>1.9</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 15:09
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 15:09
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	16-Mar-2018 15:09
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	16-Mar-2018 15:09
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 15:09
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	16-Mar-2018 15:09
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW19\_030818  
 Collection Date: 08-Mar-2018 08:15

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-01  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 15:09	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 15:09	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 15:09	
<i>Surr: 1,2-Dichloroethane-d4</i>	<i>85.6</i>			<i>0</i>	<i>81-118</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 15:09</i>	
<i>Surr: 4-Bromofluorobenzene</i>	<i>97.9</i>			<i>0</i>	<i>85-114</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 15:09</i>	
<i>Surr: Dibromofluoromethane</i>	<i>86.1</i>			<i>0</i>	<i>80-119</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 15:09</i>	
<i>Surr: Toluene-d8</i>	<i>106</i>			<i>0</i>	<i>89-112</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 15:09</i>	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>				Prep:SW3010A / 13-Mar-2018		Analyst: JCJ	
Iron	1.52		0.0120	0.100	0.200	mg/L	1	15-Mar-2018 20:34	
Manganese	0.546		0.000700	0.00100	0.00500	mg/L	1	15-Mar-2018 20:34	
<b>DISSOLVED METALS BY SW6020A</b>		<b>Method:SW6020 (dissolved)</b>				Prep:SW3010A / 13-Mar-2018		Analyst: JDE	
Iron	0.304		0.0120	0.100	0.200	mg/L	1	20-Mar-2018 17:11	
Manganese	0.490		0.000700	0.00100	0.00500	mg/L	1	20-Mar-2018 17:11	
<b>PHOSPHORUS BY E365.3</b>		<b>Method:E365.3</b>				Prep:E365.3 / 21-Mar-2018		Analyst: MZD	
Phosphorus, Total (As P)	0.129		0.0200	0.0250	0.0500	mg/L	1	22-Mar-2018 14:17	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW19\_030818  
 Collection Date: 08-Mar-2018 08:15

**ANALYTICAL REPORT**  
 WorkOrder:HS18030472  
 Lab ID:HS18030472-01  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>SULFIDE BY E376.1</b>		<b>Method:E376.1</b>		Analyst: JHD				
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	15-Mar-2018 16:58
<b>TOTAL ORGANIC CARBON BY E415.1</b>		<b>Method:E415.1</b>		Analyst: KMU				
Organic Carbon, Total	2.51		0.500	0.500	1.00	mg/L	1	20-Mar-2018 21:30
<b>ALKALINITY BY SM2320B</b>		<b>Method:SM2320B</b>		Analyst: AJH				
Alkalinity, Total (As CaCO3)	159		5.00	5.00	5.00	mg/L	1	10-Mar-2018 19:42
<b>ANIONS BY SW9056A</b>		<b>Method:SW9056</b>		Analyst: KMU				
Chloride	1,430		4.00	5.00	10.0	mg/L	20	09-Mar-2018 23:15
Nitrogen, Nitrate (As N)	0.0500	U	0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 23:00
Nitrogen, Nitrite (As N)	5.58		0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 23:00
Sulfate	1,220		4.00	5.00	10.0	mg/L	20	09-Mar-2018 23:15
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	28-Mar-2018 17:41
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41
<b>SUBCONTRACT ANALYSIS - RSK</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	23-Mar-2018 14:54
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW06\_030818  
 Collection Date: 08-Mar-2018 09:30

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-02  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						
								Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
<b>1,1-Dichloroethene</b>	<b>2.6</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 17:15
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 17:15
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	16-Mar-2018 17:15
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	16-Mar-2018 17:15
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 17:15
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	21-Mar-2018 23:51
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	16-Mar-2018 17:15
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:15
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW06\_030818  
 Collection Date: 08-Mar-2018 09:30

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-02  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 17:15	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 17:15	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:15	
Surr: 1,2-Dichloroethane-d4	85.4			0	81-118	%REC	1	16-Mar-2018 17:15	
Surr: 1,2-Dichloroethane-d4	85.2			0	81-118	%REC	1	21-Mar-2018 23:51	
Surr: 4-Bromofluorobenzene	97.3			0	85-114	%REC	1	16-Mar-2018 17:15	
Surr: 4-Bromofluorobenzene	96.5			0	85-114	%REC	1	21-Mar-2018 23:51	
Surr: Dibromofluoromethane	86.1			0	80-119	%REC	1	16-Mar-2018 17:15	
Surr: Dibromofluoromethane	87.6			0	80-119	%REC	1	21-Mar-2018 23:51	
Surr: Toluene-d8	104			0	89-112	%REC	1	16-Mar-2018 17:15	
Surr: Toluene-d8	105			0	89-112	%REC	1	21-Mar-2018 23:51	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>				Prep:SW3010A / 13-Mar-2018		Analyst: JCJ	
<b>Iron</b>	<b>0.249</b>		<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	1	15-Mar-2018 14:37	
<b>Manganese</b>	<b>0.236</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	1	15-Mar-2018 14:37	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW06\_030818  
 Collection Date: 08-Mar-2018 09:30

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-02  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>DISSOLVED METALS BY SW6020A</b>	<b>Method:SW6020 (dissolved)</b>					Prep:SW3010A / 13-Mar-2018		Analyst: JDE
Iron	0.0954	J	0.0120	0.100	0.200	mg/L	1	20-Mar-2018 17:17
Manganese	0.194		0.000700	0.00100	0.00500	mg/L	1	20-Mar-2018 17:17
<b>PHOSPHORUS BY E365.3</b>	<b>Method:E365.3</b>					Prep:E365.3 / 21-Mar-2018		Analyst: MZD
Phosphorus, Total (As P)	0.0250	U	0.0200	0.0250	0.0500	mg/L	1	22-Mar-2018 14:17
<b>SULFIDE BY E376.1</b>	<b>Method:E376.1</b>							Analyst: JHD
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	15-Mar-2018 16:58
<b>TOTAL ORGANIC CARBON BY E415.1</b>	<b>Method:E415.1</b>							Analyst: KMU
Organic Carbon, Total	1.89		0.500	0.500	1.00	mg/L	1	20-Mar-2018 21:45
<b>ALKALINITY BY SM2320B</b>	<b>Method:SM2320B</b>							Analyst: AJH
Alkalinity, Total (As CaCO3)	666		5.00	5.00	5.00	mg/L	1	10-Mar-2018 19:50
<b>ANIONS BY SW9056A</b>	<b>Method:SW9056</b>							Analyst: KMU
Chloride	1,000		4.00	5.00	10.0	mg/L	20	09-Mar-2018 23:59
Nitrogen, Nitrate (As N)	0.0500	U	0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 23:44
Nitrogen, Nitrite (As N)	4.12		0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 23:44
Sulfate	1,480		4.00	5.00	10.0	mg/L	20	09-Mar-2018 23:59
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	28-Mar-2018 17:41
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41
<b>SUBCONTRACT ANALYSIS - RSK</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Mar-2018 14:54
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>	<b>Method:NA</b>							Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW06\_030818\_a  
 Collection Date: 08-Mar-2018 09:30

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-03  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
<b>1,1-Dichloroethene</b>	<b>2.6</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 17:39	
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 17:39	
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	16-Mar-2018 17:39	
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	16-Mar-2018 17:39	
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 17:39	
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	16-Mar-2018 17:39	
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW06\_030818\_a  
 Collection Date: 08-Mar-2018 09:30

**ANALYTICAL REPORT**  
 WorkOrder:HS18030472  
 Lab ID:HS18030472-03  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 17:39	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 17:39	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 17:39	
<i>Surr: 1,2-Dichloroethane-d4</i>	<i>84.1</i>			<b>0</b>	<i>81-118</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 17:39</i>	
<i>Surr: 4-Bromofluorobenzene</i>	<i>95.9</i>			<b>0</b>	<i>85-114</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 17:39</i>	
<i>Surr: Dibromofluoromethane</i>	<i>85.2</i>			<b>0</b>	<i>80-119</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 17:39</i>	
<i>Surr: Toluene-d8</i>	<i>107</i>			<b>0</b>	<i>89-112</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 17:39</i>	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JCJ	
Iron	<b>0.196</b>	J	<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	1	15-Mar-2018 20:36	
Manganese	<b>0.226</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	1	15-Mar-2018 20:36	
<b>DISSOLVED METALS BY SW6020A</b>		<b>Method:SW6020 (dissolved)</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JDE	
Iron	<b>0.0904</b>	J	<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	1	20-Mar-2018 17:19	
Manganese	<b>0.187</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	1	20-Mar-2018 17:19	
<b>PHOSPHORUS BY E365.3</b>		<b>Method:E365.3</b>						Prep:E365.3 / 21-Mar-2018 Analyst: MZD	
Phosphorus, Total (As P)	0.0250	U	0.0200	0.0250	0.0500	mg/L	1	22-Mar-2018 14:17	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW06\_030818\_a  
 Collection Date: 08-Mar-2018 09:30

**ANALYTICAL REPORT**  
 WorkOrder:HS18030472  
 Lab ID:HS18030472-03  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>SULFIDE BY E376.1</b>		<b>Method:E376.1</b>		Analyst: JHD				
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	15-Mar-2018 16:58
<b>TOTAL ORGANIC CARBON BY E415.1</b>		<b>Method:E415.1</b>		Analyst: KMU				
Organic Carbon, Total	2.32		0.500	0.500	1.00	mg/L	1	20-Mar-2018 22:01
<b>ALKALINITY BY SM2320B</b>		<b>Method:SM2320B</b>		Analyst: AJH				
Alkalinity, Total (As CaCO3)	663		5.00	5.00	5.00	mg/L	1	10-Mar-2018 19:57
<b>ANIONS BY SW9056A</b>		<b>Method:SW9056</b>		Analyst: KMU				
Chloride	957		4.00	5.00	10.0	mg/L	20	10-Mar-2018 03:08
Nitrogen, Nitrate (As N)	0.0500	U	0.0300	0.0500	0.100	mg/L	1	10-Mar-2018 02:53
Nitrogen, Nitrite (As N)	3.56		0.0300	0.0500	0.100	mg/L	1	10-Mar-2018 02:53
Sulfate	1,460		4.00	5.00	10.0	mg/L	20	10-Mar-2018 03:08
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	28-Mar-2018 17:41
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41
<b>SUBCONTRACT ANALYSIS - RSK</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	23-Mar-2018 14:54
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW23\_030818  
 Collection Date: 08-Mar-2018 11:00

## ANALYTICAL REPORT

WorkOrder:HS18030472  
 Lab ID:HS18030472-04  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>							Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
<b>1,1-Dichloroethane</b>	<b>8.1</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 18:04	
<b>1,1-Dichloroethene</b>	<b>13</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 18:04	
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 18:04	
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	16-Mar-2018 18:04	
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	16-Mar-2018 18:04	
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 18:04	
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	16-Mar-2018 18:04	
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW23\_030818  
 Collection Date: 08-Mar-2018 11:00

**ANALYTICAL REPORT**  
 WorkOrder:HS18030472  
 Lab ID:HS18030472-04  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
<b>cis-1,2-Dichloroethene</b>	<b>21</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 18:04	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 18:04	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 18:04	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
<b>Trichloroethene</b>	<b>27</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 18:04	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:04	
<b>Vinyl chloride</b>	<b>3.1</b>		<b>0.20</b>	<b>0.50</b>	<b>1.0</b>	<b>ug/L</b>	1	16-Mar-2018 18:04	
<i>Surr: 1,2-Dichloroethane-d4</i>	<i>86.7</i>			<b>0</b>	<i>81-118</i>	<b>%REC</b>	1	16-Mar-2018 18:04	
<i>Surr: 4-Bromofluorobenzene</i>	<i>97.0</i>			<b>0</b>	<i>85-114</i>	<b>%REC</b>	1	16-Mar-2018 18:04	
<i>Surr: Dibromofluoromethane</i>	<i>84.1</i>			<b>0</b>	<i>80-119</i>	<b>%REC</b>	1	16-Mar-2018 18:04	
<i>Surr: Toluene-d8</i>	<i>104</i>			<b>0</b>	<i>89-112</i>	<b>%REC</b>	1	16-Mar-2018 18:04	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JCJ	
<b>Iron</b>	<b>0.619</b>		<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	1	15-Mar-2018 20:38	
<b>Manganese</b>	<b>0.502</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	1	15-Mar-2018 20:38	
<b>DISSOLVED METALS BY SW6020A</b>		<b>Method:SW6020 (dissolved)</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JDE	
<b>Iron</b>	0.100	U	0.0120	0.100	0.200	mg/L	1	20-Mar-2018 17:21	
<b>Manganese</b>	<b>0.482</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	1	20-Mar-2018 17:21	
<b>PHOSPHORUS BY E365.3</b>		<b>Method:E365.3</b>						Prep:E365.3 / 21-Mar-2018 Analyst: MZD	
<b>Phosphorus, Total (As P)</b>	<b>0.153</b>		<b>0.0200</b>	<b>0.0250</b>	<b>0.0500</b>	<b>mg/L</b>	1	22-Mar-2018 14:17	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW23\_030818  
 Collection Date: 08-Mar-2018 11:00

**ANALYTICAL REPORT**  
 WorkOrder:HS18030472  
 Lab ID:HS18030472-04  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>SULFIDE BY E376.1</b>		<b>Method:E376.1</b>		Analyst: JHD				
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	15-Mar-2018 16:58
<b>TOTAL ORGANIC CARBON BY E415.1</b>		<b>Method:E415.1</b>		Analyst: KMU				
Organic Carbon, Total	3.31		0.500	0.500	1.00	mg/L	1	20-Mar-2018 22:46
<b>ALKALINITY BY SM2320B</b>		<b>Method:SM2320B</b>		Analyst: AJH				
Alkalinity, Total (As CaCO3)	608		5.00	5.00	5.00	mg/L	1	10-Mar-2018 20:03
<b>ANIONS BY SW9056A</b>		<b>Method:SW9056</b>		Analyst: KMU				
Chloride	487		4.00	5.00	10.0	mg/L	20	12-Mar-2018 14:19
Nitrogen, Nitrate (As N)	1.20		0.0300	0.0500	0.100	mg/L	1	10-Mar-2018 04:50
Nitrogen, Nitrite (As N)	2.29		0.0300	0.0500	0.100	mg/L	1	10-Mar-2018 04:50
Sulfate	761		4.00	5.00	10.0	mg/L	20	12-Mar-2018 14:19
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	28-Mar-2018 17:41
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41
<b>SUBCONTRACT ANALYSIS - RSK</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	23-Mar-2018 14:54
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW24\_030818  
 Collection Date: 08-Mar-2018 12:10

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-05  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						
								Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 18:28
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	16-Mar-2018 18:28
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	16-Mar-2018 18:28
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 18:28
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	16-Mar-2018 18:28
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW24\_030818  
 Collection Date: 08-Mar-2018 12:10

**ANALYTICAL REPORT**  
 WorkOrder:HS18030472  
 Lab ID:HS18030472-05  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>						Analyst: AKP	
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 18:28	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 18:28	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 18:28	
<i>Surr: 1,2-Dichloroethane-d4</i>	<i>85.6</i>			<b>0</b>	<i>81-118</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 18:28</i>	
<i>Surr: 4-Bromofluorobenzene</i>	<i>97.4</i>			<b>0</b>	<i>85-114</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 18:28</i>	
<i>Surr: Dibromofluoromethane</i>	<i>85.6</i>			<b>0</b>	<i>80-119</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 18:28</i>	
<i>Surr: Toluene-d8</i>	<i>106</i>			<b>0</b>	<i>89-112</i>	<b>%REC</b>	<i>1</i>	<i>16-Mar-2018 18:28</i>	
<b>ICP-MS METALS BY SW6020A</b>		<b>Method:SW6020</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JCJ	
<b>Iron</b>	<b>0.475</b>		<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	<b>1</b>	<b>15-Mar-2018 20:41</b>	
<b>Manganese</b>	<b>0.369</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	<b>1</b>	<b>15-Mar-2018 20:41</b>	
<b>DISSOLVED METALS BY SW6020A</b>		<b>Method:SW6020 (dissolved)</b>						Prep:SW3010A / 13-Mar-2018 Analyst: JDE	
<b>Iron</b>	<b>0.0358</b>	<b>J</b>	<b>0.0120</b>	<b>0.100</b>	<b>0.200</b>	<b>mg/L</b>	<b>1</b>	<b>20-Mar-2018 17:23</b>	
<b>Manganese</b>	<b>0.374</b>		<b>0.000700</b>	<b>0.00100</b>	<b>0.00500</b>	<b>mg/L</b>	<b>1</b>	<b>20-Mar-2018 17:23</b>	
<b>PHOSPHORUS BY E365.3</b>		<b>Method:E365.3</b>						Prep:E365.3 / 21-Mar-2018 Analyst: MZD	
<b>Phosphorus, Total (As P)</b>	<b>0.0240</b>	<b>J</b>	<b>0.0200</b>	<b>0.0250</b>	<b>0.0500</b>	<b>mg/L</b>	<b>1</b>	<b>22-Mar-2018 14:17</b>	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: 35AWW24\_030818  
 Collection Date: 08-Mar-2018 12:10

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-05  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>SULFIDE BY E376.1</b>		<b>Method:E376.1</b>		Analyst: JHD				
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	15-Mar-2018 16:58
<b>TOTAL ORGANIC CARBON BY E415.1</b>		<b>Method:E415.1</b>		Analyst: KMU				
Organic Carbon, Total	1.45		0.500	0.500	1.00	mg/L	1	20-Mar-2018 23:02
<b>ALKALINITY BY SM2320B</b>		<b>Method:SM2320B</b>		Analyst: AJH				
Alkalinity, Total (As CaCO3)	66.5		5.00	5.00	5.00	mg/L	1	10-Mar-2018 20:08
<b>ANIONS BY SW9056A</b>		<b>Method:SW9056</b>		Analyst: KMU				
Chloride	119		2.00	2.50	5.00	mg/L	10	09-Mar-2018 21:33
Nitrogen, Nitrate (As N)	0.110		0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 20:49
Nitrogen, Nitrite (As N)	0.213		0.0300	0.0500	0.100	mg/L	1	09-Mar-2018 20:49
Sulfate	85.7		0.200	0.250	0.500	mg/L	1	09-Mar-2018 20:49
<b>SUBCONTRACT ANALYSIS - DHC/DHB</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	28-Mar-2018 17:41
<b>SUBCONTRACT ANALYSIS - FERROUS IRON</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41
<b>SUBCONTRACT ANALYSIS - RSK</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	23-Mar-2018 14:54
<b>SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS</b>		<b>Method:NA</b>		Analyst: SUB				
Subcontract Analysis	See Attached		0	0		NA	1	30-Mar-2018 15:41

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: Trip Blank  
 Collection Date: 08-Mar-2018 00:00

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-06  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD 8260C</b>		<b>Method:SW8260</b>							Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 13:55	
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	16-Mar-2018 13:55	
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	16-Mar-2018 13:55	
Acetone	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 13:55	
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	16-Mar-2018 13:55	
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.  
 Project: LHAAP-58  
 Sample ID: Trip Blank  
 Collection Date: 08-Mar-2018 00:00

**ANALYTICAL REPORT**

WorkOrder:HS18030472  
 Lab ID:HS18030472-06  
 Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED	
<b>VOLATILES ORGANICS BY METHOD</b>		<b>Method:SW8260</b>							Analyst: AKP
<b>8260C</b>									
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	16-Mar-2018 13:55	
Methylene chloride	1.0	U	0.40	1.0	2.0	ug/L	1	16-Mar-2018 13:55	
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Mar-2018 13:55	
<i>Surr: 1,2-Dichloroethane-d4</i>	<i>84.5</i>			<b>0</b>	<i>81-118</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 13:55</i>	
<i>Surr: 4-Bromofluorobenzene</i>	<i>95.5</i>			<b>0</b>	<i>85-114</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 13:55</i>	
<i>Surr: Dibromofluoromethane</i>	<i>85.3</i>			<b>0</b>	<i>80-119</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 13:55</i>	
<i>Surr: Toluene-d8</i>	<i>105</i>			<b>0</b>	<i>89-112</i>	<i>%REC</i>	<i>1</i>	<i>16-Mar-2018 13:55</i>	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## WEIGHT LOG

Client: Bhate Environmental Associates, Inc.

Project: LHAAP-58

WorkOrder: HS18030472

**Batch ID:** 126131      **Method:** ICP-MS METALS BY SW6020A      **Prep:** 3010A

SampleID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18030472-01	1	10	10 (mL)	1
HS18030472-02	1	10	10 (mL)	1
HS18030472-03	1	10	10 (mL)	1
HS18030472-04	1	10	10 (mL)	1
HS18030472-05	1	10	10 (mL)	1

**Batch ID:** 126134      **Method:** DISSOLVED METALS BY SW6020A      **Prep:** 3010A DISS

SampleID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18030472-01	1	10	10 (mL)	1
HS18030472-02	1	10	10 (mL)	1
HS18030472-03	1	10	10 (mL)	1
HS18030472-04	1	10	10 (mL)	1
HS18030472-05	1	10	10 (mL)	1

**Batch ID:** 126467      **Method:** PHOSPHORUS BY E365.3      **Prep:** P\_TW\_PR

SampleID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18030472-01	1	50	50 (mL)	1
HS18030472-02	1	50	50 (mL)	1
HS18030472-03	1	50	50 (mL)	1
HS18030472-04	1	50	50 (mL)	1
HS18030472-05	1	50	50 (mL)	1

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID</b> 126131	<b>Test Name :</b> ICP-MS METALS BY SW6020A			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15		13 Mar 2018 11:00	15 Mar 2018 20:34	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30		13 Mar 2018 11:00	15 Mar 2018 14:37	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30		13 Mar 2018 11:00	15 Mar 2018 20:36	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00		13 Mar 2018 11:00	15 Mar 2018 20:38	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10		13 Mar 2018 11:00	15 Mar 2018 20:41	1
<b>Batch ID</b> 126134	<b>Test Name :</b> DISSOLVED METALS BY SW6020A			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15		13 Mar 2018 11:00	20 Mar 2018 17:11	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30		13 Mar 2018 11:00	20 Mar 2018 17:17	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30		13 Mar 2018 11:00	20 Mar 2018 17:19	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00		13 Mar 2018 11:00	20 Mar 2018 17:21	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10		13 Mar 2018 11:00	20 Mar 2018 17:23	1
<b>Batch ID</b> 126467	<b>Test Name :</b> PHOSPHORUS BY E365.3			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15		21 Mar 2018 14:00	22 Mar 2018 14:17	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30		21 Mar 2018 14:00	22 Mar 2018 14:17	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30		21 Mar 2018 14:00	22 Mar 2018 14:17	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00		21 Mar 2018 14:00	22 Mar 2018 14:17	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10		21 Mar 2018 14:00	22 Mar 2018 14:17	1
<b>Batch ID</b> R312300	<b>Test Name :</b> ALKALINITY BY SM2320B			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			10 Mar 2018 19:42	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			10 Mar 2018 19:50	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			10 Mar 2018 19:57	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			10 Mar 2018 20:03	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			10 Mar 2018 20:08	1
<b>Batch ID</b> R312607	<b>Test Name :</b> ANIONS BY SW9056A			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			09 Mar 2018 23:15	20
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			09 Mar 2018 23:00	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			09 Mar 2018 23:59	20
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			09 Mar 2018 23:44	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			10 Mar 2018 03:08	20
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			10 Mar 2018 02:53	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			12 Mar 2018 14:19	20
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			10 Mar 2018 04:50	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			09 Mar 2018 21:33	10
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			09 Mar 2018 20:49	1

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID</b> R312659	<b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			16 Mar 2018 15:09	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			16 Mar 2018 17:15	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			16 Mar 2018 17:39	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			16 Mar 2018 18:04	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			16 Mar 2018 18:28	1
HS18030472-06	Trip Blank	08 Mar 2018 00:00			16 Mar 2018 13:55	1
<b>Batch ID</b> R312695	<b>Test Name :</b> SULFIDE BY E376.1			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			15 Mar 2018 16:58	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			15 Mar 2018 16:58	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			15 Mar 2018 16:58	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			15 Mar 2018 16:58	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			15 Mar 2018 16:58	1
<b>Batch ID</b> R312878	<b>Test Name :</b> TOTAL ORGANIC CARBON BY E415.1			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			20 Mar 2018 21:30	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			20 Mar 2018 21:45	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			20 Mar 2018 22:01	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			20 Mar 2018 22:46	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			20 Mar 2018 23:02	1
<b>Batch ID</b> R312915	<b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C			<b>Matrix:</b> Water		
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			21 Mar 2018 23:51	1
<b>Batch ID</b> R313033	<b>Test Name :</b> SUBCONTRACT ANALYSIS - RSK			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			23 Mar 2018 14:54	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			23 Mar 2018 14:54	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			23 Mar 2018 14:54	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			23 Mar 2018 14:54	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			23 Mar 2018 14:54	1
<b>Batch ID</b> R313295	<b>Test Name :</b> SUBCONTRACT ANALYSIS - DHC/DHB			<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			28 Mar 2018 17:41	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			28 Mar 2018 17:41	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			28 Mar 2018 17:41	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			28 Mar 2018 17:41	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			28 Mar 2018 17:41	1

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID</b> R313455		<b>Test Name :</b> SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		<b>Matrix:</b> Water		
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			30 Mar 2018 15:41	1
HS18030472-01	35AWW19_030818	08 Mar 2018 08:15			30 Mar 2018 15:41	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			30 Mar 2018 15:41	1
HS18030472-02	35AWW06_030818	08 Mar 2018 09:30			30 Mar 2018 15:41	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			30 Mar 2018 15:41	1
HS18030472-03	35AWW06_030818_a	08 Mar 2018 09:30			30 Mar 2018 15:41	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			30 Mar 2018 15:41	1
HS18030472-04	35AWW23_030818	08 Mar 2018 11:00			30 Mar 2018 15:41	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			30 Mar 2018 15:41	1
HS18030472-05	35AWW24_030818	08 Mar 2018 12:10			30 Mar 2018 15:41	1

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID: 126131		Instrument: ICPMS04		Method: SW6020						
<b>MBLK</b>	Sample ID: <b>MBLK-126131</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:28</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475111</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	0.100	0.200							U	
Manganese	0.00100	0.00500							U	
<b>LCS</b>	Sample ID: <b>LCS-126131</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:30</b>						
Client ID:	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475112</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	5.028	0.200	5	0	101	80 - 120				
Manganese	0.04894	0.00500	0.05	0	97.9	80 - 120				
<b>MS</b>	Sample ID: <b>HS18030472-02MS</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:41</b>						
Client ID: <b>35AWW06_030818</b>	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475117</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	4.792	0.200	5	0.2489	90.9	80 - 120				
Manganese	0.2801	0.00500	0.05	0.2357	88.8	80 - 120			O	
<b>MSD</b>	Sample ID: <b>HS18030472-02MSD</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:43</b>						
Client ID: <b>35AWW06_030818</b>	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475118</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	4.716	0.200	5	0.2489	89.3	80 - 120	4.792	1.6	20	
Manganese	0.2738	0.00500	0.05	0.2357	76.1	80 - 120	0.2801	2.3	20 SO	
<b>PDS</b>	Sample ID: <b>HS18030472-02PDS</b>	Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:46</b>						
Client ID: <b>35AWW06_030818</b>	Run ID: <b>ICPMS04_312510</b>	SeqNo: <b>4475119</b>	PrepDate: <b>13-Mar-2018</b>	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Iron	8.895	0.200	10	0.2489	86.5	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID: 126131		Instrument: ICPMS04		Method: SW6020														
<b>PDS</b>		Sample ID: <b>HS18030472-02PDS</b>		Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 15:57</b>												
Client ID: <b>35AWW06_030818</b>		Run ID: <b>ICPMS04_312510</b>		SeqNo: <b>4475373</b>		PrepDate: <b>13-Mar-2018</b> DF: <b>1</b>												
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual								
Manganese	0.3109	0.00500	0.1	0.2357	75.1	75 - 125												
<b>SD</b>		Sample ID: <b>HS18030472-02SD</b>		Units: <b>mg/L</b>		Analysis Date: <b>15-Mar-2018 14:39</b>												
Client ID: <b>35AWW06_030818</b>		Run ID: <b>ICPMS04_312510</b>		SeqNo: <b>4475116</b>		PrepDate: <b>13-Mar-2018</b> DF: <b>5</b>												
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual								
Iron	0.2493	1.00					0.2489	0	10	J								
Manganese	0.2312	0.0250					0.2357	1.91	10									
<b>The following samples were analyzed in this batch:</b>																		
<table border="1"> <tr> <td>HS18030472-01</td> <td>HS18030472-02</td> <td>HS18030472-03</td> <td>HS18030472-04</td> </tr> <tr> <td>HS18030472-05</td> <td></td> <td></td> <td></td> </tr> </table>											HS18030472-01	HS18030472-02	HS18030472-03	HS18030472-04	HS18030472-05			
HS18030472-01	HS18030472-02	HS18030472-03	HS18030472-04															
HS18030472-05																		

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID:	126134	Instrument:	ICPMS05	Method:	SW6020 (dissolved) (DISSOLVED)					
<b>MBLK</b>	Sample ID: <b>MBLK-126134</b>	Units:	mg/L	Analysis Date:	20-Mar-2018 16:53					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo:	4481013	PrepDate:	13-Mar-2018 DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.00100	0.00500								U
<b>LCS</b>	Sample ID: <b>LCS-126134</b>	Units:	mg/L	Analysis Date:	20-Mar-2018 16:55					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo:	4481014	PrepDate:	13-Mar-2018 DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	5.152	0.200	5	0	103	80 - 120				
Manganese	0.05024	0.00500	0.05	0	100	80 - 120				
<b>MS</b>	Sample ID: <b>HS18030365-01MS</b>	Units:	mg/L	Analysis Date:	20-Mar-2018 17:01					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo:	4481017	PrepDate:	13-Mar-2018 DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	5.17	0.200	5	0.4629	94.1	75 - 125				
Manganese	1.735	0.00500	0.05	1.729	13.1	75 - 125				SO
<b>MSD</b>	Sample ID: <b>HS18030365-01MSD</b>	Units:	mg/L	Analysis Date:	20-Mar-2018 17:03					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo:	4481018	PrepDate:	13-Mar-2018 DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	5.252	0.200	5	0.4629	95.8	75 - 125	5.17	1.58	20	
Manganese	1.754	0.00500	0.05	1.729	50.9	75 - 125	1.735	1.08	20	SO
<b>PDS</b>	Sample ID: <b>HS18030365-01PDS</b>	Units:	mg/L	Analysis Date:	20-Mar-2018 17:05					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo:	4481019	PrepDate:	13-Mar-2018 DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	9.775	0.200	10	0.4629	93.1	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID:	126134	Instrument:	ICPMS05	Method:	SW6020 (dissolved) (DISSOLVED)					
<b>PDS</b>	Sample ID: <b>HS18030365-01PDS</b>	Units:	mg/L	Analysis Date:	<b>21-Mar-2018 13:00</b>					
Client ID:	Run ID: <b>ICPMS05_312849</b>	SeqNo:	<b>4482372</b>	PrepDate:	<b>13-Mar-2018 DF: 5</b>					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Manganese	2.022	0.0250	0.5	1.552	94.1	75 - 125				
<b>SD</b>	Sample ID: <b>HS18030365-01SD</b>	Units:	mg/L	Analysis Date:	<b>20-Mar-2018 16:59</b>					
Client ID:	Run ID: <b>ICPMS05_312756</b>	SeqNo:	<b>4481016</b>	PrepDate:	<b>13-Mar-2018 DF: 5</b>					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	0.4875	1.00					0.4629	0	10	J
<b>SD</b>	Sample ID: <b>HS18030365-01SD</b>	Units:	mg/L	Analysis Date:	<b>21-Mar-2018 12:58</b>					
Client ID:	Run ID: <b>ICPMS05_312849</b>	SeqNo:	<b>4482371</b>	PrepDate:	<b>13-Mar-2018 DF: 25</b>					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Manganese	1.534	0.125					1.552	1.13	10	
<b>The following samples were analyzed in this batch:</b>										
HS18030472-01 HS18030472-02 HS18030472-03 HS18030472-04 HS18030472-05										

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
MBLK	Sample ID: VBLKW-180316	Units: ug/L			Analysis Date: 16-Mar-2018 13:06					
Client ID:	Run ID: VOA2_312659	SeqNo: 4477674	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	0.50	1.0								U
1,1,1-Trichloroethane	0.50	1.0								U
1,1,2,2-Tetrachloroethane	0.50	1.0								U
1,1,2-Trichloroethane	0.50	1.0								U
1,1-Dichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,1-Dichloropropene	0.50	1.0								U
1,2,3-Trichlorobenzene	0.50	1.0								U
1,2,3-Trichloropropane	0.50	1.0								U
1,2,4-Trichlorobenzene	0.50	1.0								U
1,2,4-Trimethylbenzene	0.50	1.0								U
1,2-Dibromo-3-chloropropane	0.50	1.0								U
1,2-Dibromoethane	0.50	1.0								U
1,2-Dichlorobenzene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
1,2-Dichloropropane	0.50	1.0								U
1,3,5-Trimethylbenzene	0.50	1.0								U
1,3-Dichlorobenzene	0.50	1.0								U
1,3-Dichloropropane	0.50	1.0								U
1,4-Dichlorobenzene	0.50	1.0								U
2,2-Dichloropropane	0.50	1.0								U
2-Butanone	1.0	2.0								U
2-Chlorotoluene	0.50	1.0								U
2-Hexanone	1.0	2.0								U
4-Chlorotoluene	0.50	1.0								U
4-Isopropyltoluene	0.50	1.0								U
4-Methyl-2-pentanone	1.0	2.0								U
Acetone	1.0	2.0								U
Benzene	0.50	1.0								U
Bromobenzene	0.50	1.0								U
Bromochloromethane	0.50	1.0								U
Bromodichloromethane	0.50	1.0								U
Bromoform	0.50	1.0								U
Bromomethane	0.50	1.0								U

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
MBLK	Sample ID: VBLKW-180316	Units: ug/L			Analysis Date: 16-Mar-2018 13:06					
Client ID:	Run ID: VOA2_312659	SeqNo: 4477674	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	1.0	2.0								U
Carbon tetrachloride	0.50	1.0								U
Chlorobenzene	0.50	1.0								U
Chloroethane	0.50	1.0								U
Chloroform	0.50	1.0								U
Chloromethane	0.50	1.0								U
cis-1,2-Dichloroethene	0.50	1.0								U
cis-1,3-Dichloropropene	0.50	1.0								U
Dibromochloromethane	0.50	1.0								U
Dibromomethane	0.50	1.0								U
Dichlorodifluoromethane	0.50	1.0								U
Ethylbenzene	0.50	1.0								U
Hexachlorobutadiene	0.50	1.0								U
Isopropylbenzene	0.50	1.0								U
m,p-Xylene	1.0	2.0								U
Methylene chloride	1.0	2.0								U
Naphthalene	0.50	1.0								U
n-Butylbenzene	0.50	1.0								U
n-Propylbenzene	0.50	1.0								U
o-Xylene	0.50	1.0								U
sec-Butylbenzene	0.50	1.0								U
Styrene	0.50	1.0								U
tert-Butylbenzene	0.50	1.0								U
Tetrachloroethene	0.50	1.0								U
Toluene	0.50	1.0								U
trans-1,2-Dichloroethene	0.50	1.0								U
trans-1,3-Dichloropropene	0.50	1.0								U
Trichloroethene	0.50	1.0								U
Trichlorofluoromethane	0.50	1.0								U
Vinyl chloride	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	42.05	1.0	50	0	84.1	81 - 118				
Surr: 4-Bromofluorobenzene	48.34	1.0	50	0	96.7	85 - 114				
Surr: Dibromofluoromethane	42.08	1.0	50	0	84.2	80 - 119				
Surr: Toluene-d8	52.32	1.0	50	0	105	89 - 112				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
LCS	Sample ID: VLCSW-180316	Units: ug/L			Analysis Date: 16-Mar-2018 12:17					
Client ID:	Run ID: VOA2_312659	SeqNo: 4477672	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	47.23	1.0	50	0	94.5	78 - 124				
1,1,1-Trichloroethane	48.66	1.0	50	0	97.3	74 - 131				
1,1,2,2-Tetrachloroethane	40.32	1.0	50	0	80.6	71 - 121				
1,1,2-Trichloroethane	44.46	1.0	50	0	88.9	80 - 119				
1,1-Dichloroethane	44.71	1.0	50	0	89.4	77 - 125				
1,1-Dichloroethene	46.74	1.0	50	0	93.5	71 - 131				
1,1-Dichloropropene	49.83	1.0	50	0	99.7	79 - 125				
1,2,3-Trichlorobenzene	46.11	1.0	50	0	92.2	69 - 129				
1,2,3-Trichloropropane	42.02	1.0	50	0	84.0	73 - 122				
1,2,4-Trichlorobenzene	47.21	1.0	50	0	94.4	69 - 130				
1,2,4-Trimethylbenzene	47.92	1.0	50	0	95.8	76 - 124				
1,2-Dibromo-3-chloropropane	43.02	1.0	50	0	86.0	62 - 128				
1,2-Dibromoethane	46.94	1.0	50	0	93.9	77 - 121				
1,2-Dichlorobenzene	42.24	1.0	50	0	84.5	80 - 119				
1,2-Dichloroethane	47.83	1.0	50	0	95.7	73 - 128				
1,2-Dichloropropane	45.76	1.0	50	0	91.5	78 - 122				
1,3,5-Trimethylbenzene	48.43	1.0	50	0	96.9	75 - 124				
1,3-Dichlorobenzene	43.72	1.0	50	0	87.4	80 - 119				
1,3-Dichloropropane	43.57	1.0	50	0	87.1	80 - 119				
1,4-Dichlorobenzene	42.53	1.0	50	0	85.1	79 - 118				
2,2-Dichloropropane	46.59	1.0	50	0	93.2	60 - 139				
2-Butanone	92.97	2.0	100	0	93.0	56 - 143				
2-Chlorotoluene	47.14	1.0	50	0	94.3	79 - 122				
2-Hexanone	93.66	2.0	100	0	93.7	57 - 139				
4-Chlorotoluene	47.54	1.0	50	0	95.1	78 - 122				
4-Isopropyltoluene	43.19	1.0	50	0	86.4	77 - 127				
4-Methyl-2-pentanone	86.34	2.0	100	0	86.3	67 - 130				
Acetone	96.25	2.0	100	0	96.2	39 - 160				
Benzene	46.24	1.0	50	0	92.5	79 - 120				
Bromobenzene	41.88	1.0	50	0	83.8	80 - 120				
Bromochloromethane	50.78	1.0	50	0	102	78 - 123				
Bromodichloromethane	49.07	1.0	50	0	98.1	79 - 125				
Bromoform	50.32	1.0	50	0	101	66 - 130				
Bromomethane	50.85	1.0	50	0	102	53 - 141				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
LCS	Sample ID: VLCSW-180316	Units: ug/L			Analysis Date: 16-Mar-2018 12:17					
Client ID:	Run ID: VOA2_312659	SeqNo: 4477672		PrepDate:		DF: 1				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	90.86	2.0	100	0	90.9	64 - 133				
Carbon tetrachloride	47.92	1.0	50	0	95.8	72 - 136				
Chlorobenzene	45.41	1.0	50	0	90.8	80 - 120				
Chloroethane	42.7	1.0	50	0	85.4	82 - 118				
Chloroform	44.24	1.0	50	0	88.5	79 - 124				
Chloromethane	46.84	1.0	50	0	93.7	50 - 139				
cis-1,2-Dichloroethene	48.47	1.0	50	0	96.9	78 - 123				
cis-1,3-Dichloropropene	50.21	1.0	50	0	100	75 - 124				
Dibromochloromethane	48.12	1.0	50	0	96.2	74 - 126				
Dibromomethane	51.61	1.0	50	0	103	79 - 123				
Dichlorodifluoromethane	40.68	1.0	50	0	81.4	32 - 152				
Ethylbenzene	51.29	1.0	50	0	103	79 - 121				
Hexachlorobutadiene	46.29	1.0	50	0	92.6	66 - 134				
Isopropylbenzene	46.53	1.0	50	0	93.1	72 - 131				
m,p-Xylene	89.9	2.0	100	0	89.9	80 - 121				
Methylene chloride	43.13	2.0	50	0	86.3	74 - 124				
Naphthalene	49.17	1.0	50	0	98.3	61 - 128				
n-Butylbenzene	44.74	1.0	50	0	89.5	75 - 128				
n-Propylbenzene	42.11	1.0	50	0	84.2	76 - 126				
o-Xylene	45.86	1.0	50	0	91.7	78 - 122				
sec-Butylbenzene	44.43	1.0	50	0	88.9	77 - 126				
Styrene	45.68	1.0	50	0	91.4	78 - 128				
tert-Butylbenzene	42.92	1.0	50	0	85.8	78 - 124				
Tetrachloroethene	46.83	1.0	50	0	93.7	74 - 129				
Toluene	43.52	1.0	50	0	87.0	80 - 121				
trans-1,2-Dichloroethene	49.3	1.0	50	0	98.6	75 - 124				
trans-1,3-Dichloropropene	52.97	1.0	50	0	106	73 - 127				
Trichloroethene	49.58	1.0	50	0	99.2	79 - 123				
Trichlorofluoromethane	47.28	1.0	50	0	94.6	65 - 141				
Vinyl chloride	45.51	1.0	50	0	91.0	58 - 137				
Surr: 1,2-Dichloroethane-d4	43.66	1.0	50	0	87.3	81 - 118				
Surr: 4-Bromofluorobenzene	50.08	1.0	50	0	100	85 - 114				
Surr: Dibromofluoromethane	41.09	1.0	50	0	82.2	80 - 119				
Surr: Toluene-d8	50.44	1.0	50	0	101	89 - 112				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
MS	Sample ID: HS18030472-01MS	Units: ug/L			Analysis Date: 16-Mar-2018 15:58					
Client ID: 35AWW19_030818	Run ID: VOA2_312659	SeqNo: 4477681	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	43.46	1.0	50	0	86.9	78 - 124				
1,1,1-Trichloroethane	46.73	1.0	50	0	93.5	74 - 131				
1,1,2,2-Tetrachloroethane	37.92	1.0	50	0	75.8	71 - 121				
1,1,2-Trichloroethane	40.81	1.0	50	0	81.6	80 - 119				
1,1-Dichloroethane	43.79	1.0	50	0	87.6	77 - 125				
1,1-Dichloroethene	54.72	1.0	50	9.032	91.4	71 - 131				
1,1-Dichloropropene	46.9	1.0	50	0	93.8	79 - 125				
1,2,3-Trichlorobenzene	40.65	1.0	50	0	81.3	69 - 129				
1,2,3-Trichloropropane	38.96	1.0	50	0	77.9	73 - 122				
1,2,4-Trichlorobenzene	41.37	1.0	50	0	82.7	69 - 130				
1,2,4-Trimethylbenzene	43.59	1.0	50	0	87.2	76 - 124				
1,2-Dibromo-3-chloropropane	41.62	1.0	50	0	83.2	62 - 128				
1,2-Dibromoethane	43.82	1.0	50	0	87.6	77 - 121				
1,2-Dichlorobenzene	38.26	1.0	50	0	76.5	80 - 119				S
1,2-Dichloroethane	43.58	1.0	50	1.942	83.3	73 - 128				
1,2-Dichloropropane	41.62	1.0	50	0	83.2	78 - 122				
1,3,5-Trimethylbenzene	44.04	1.0	50	0	88.1	75 - 124				
1,3-Dichlorobenzene	38.47	1.0	50	0	76.9	80 - 119				S
1,3-Dichloropropane	40.21	1.0	50	0	80.4	80 - 119				
1,4-Dichlorobenzene	37.29	1.0	50	0	74.6	79 - 118				S
2,2-Dichloropropane	44.91	1.0	50	0	89.8	60 - 139				
2-Butanone	92.32	2.0	100	0	92.3	56 - 143				
2-Chlorotoluene	42.52	1.0	50	0	85.0	79 - 122				
2-Hexanone	92.7	2.0	100	0	92.7	57 - 139				
4-Chlorotoluene	42.99	1.0	50	0	86.0	78 - 122				
4-Isopropyltoluene	38.85	1.0	50	0	77.7	77 - 127				
4-Methyl-2-pentanone	85.96	2.0	100	0	86.0	67 - 130				
Acetone	85.8	2.0	100	0	85.8	39 - 160				
Benzene	42.79	1.0	50	0	85.6	79 - 120				
Bromobenzene	37.85	1.0	50	0	75.7	80 - 120				S
Bromochloromethane	46.43	1.0	50	0	92.9	78 - 123				
Bromodichloromethane	44.5	1.0	50	0	89.0	79 - 125				
Bromoform	47.64	1.0	50	0	95.3	66 - 130				
Bromomethane	36.6	1.0	50	0	73.2	53 - 141				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
MS		Sample ID: HS18030472-01MS		Units: ug/L		Analysis Date: 16-Mar-2018 15:58				
Client ID: 35AWW19_030818		Run ID: VOA2_312659		SeqNo: 4477681		PrepDate:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	89.2	2.0	100	0	89.2	64 - 133				
Carbon tetrachloride	49.42	1.0	50	0	98.8	72 - 136				
Chlorobenzene	41.46	1.0	50	0	82.9	80 - 120				
Chloroethane	43.86	1.0	50	0	87.7	82 - 118				
Chloroform	41.06	1.0	50	0	82.1	79 - 124				
Chloromethane	40.5	1.0	50	0	81.0	50 - 139				
cis-1,2-Dichloroethene	44.07	1.0	50	0	88.1	78 - 123				
cis-1,3-Dichloropropene	44.61	1.0	50	0	89.2	75 - 124				
Dibromochloromethane	44.38	1.0	50	0	88.8	74 - 126				
Dibromomethane	45.52	1.0	50	0	91.0	79 - 123				
Dichlorodifluoromethane	38.78	1.0	50	0	77.6	32 - 152				
Ethylbenzene	47.94	1.0	50	0	95.9	79 - 121				
Hexachlorobutadiene	37.33	1.0	50	0	74.7	66 - 134				
Isopropylbenzene	43.96	1.0	50	0	87.9	72 - 131				
m,p-Xylene	84.19	2.0	100	0	84.2	80 - 121				
Methylene chloride	38.21	2.0	50	0	76.4	74 - 124				
Naphthalene	44.6	1.0	50	0	89.2	61 - 128				
n-Butylbenzene	39.59	1.0	50	0	79.2	75 - 128				
n-Propylbenzene	38.87	1.0	50	0	77.7	76 - 126				
o-Xylene	42.25	1.0	50	0	84.5	78 - 122				
sec-Butylbenzene	40.11	1.0	50	0	80.2	77 - 126				
Styrene	41.69	1.0	50	0	83.4	78 - 128				
tert-Butylbenzene	39.61	1.0	50	0	79.2	78 - 124				
Tetrachloroethene	45.99	1.0	50	0	92.0	74 - 129				
Toluene	41.1	1.0	50	0	82.2	80 - 121				
trans-1,2-Dichloroethene	45.27	1.0	50	0	90.5	75 - 124				
trans-1,3-Dichloropropene	45.76	1.0	50	0	91.5	73 - 127				
Trichloroethene	47.78	1.0	50	0	95.6	79 - 123				
Trichlorofluoromethane	44.84	1.0	50	0	89.7	65 - 141				
Vinyl chloride	42.85	1.0	50	0	85.7	58 - 137				
Surr: 1,2-Dichloroethane-d4	43.54	1.0	50	0	87.1	81 - 118				
Surr: 4-Bromofluorobenzene	50.42	1.0	50	0	101	85 - 114				
Surr: Dibromofluoromethane	40.9	1.0	50	0	81.8	80 - 119				
Surr: Toluene-d8	51.22	1.0	50	0	102	89 - 112				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
MSD		Sample ID: HS18030472-01MSD		Units: ug/L		Analysis Date: 16-Mar-2018 16:23				
Client ID: 35AWW19_030818		Run ID: VOA2_312659		SeqNo: 4477682		PrepDate:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
1,1,1,2-Tetrachloroethane	42.17	1.0	50	0	84.3	78 - 124	43.46	3.01	20	
1,1,1-Trichloroethane	45.35	1.0	50	0	90.7	74 - 131	46.73	3	20	
1,1,2,2-Tetrachloroethane	38.19	1.0	50	0	76.4	71 - 121	37.92	0.693	20	
1,1,2-Trichloroethane	40.18	1.0	50	0	80.4	80 - 119	40.81	1.54	20	
1,1-Dichloroethane	41.98	1.0	50	0	84.0	77 - 125	43.79	4.24	20	
1,1-Dichloroethene	53.29	1.0	50	9.032	88.5	71 - 131	54.72	2.66	20	
1,1-Dichloropropene	47.67	1.0	50	0	95.3	79 - 125	46.9	1.65	20	
1,2,3-Trichlorobenzene	42.96	1.0	50	0	85.9	69 - 129	40.65	5.53	20	
1,2,3-Trichloropropane	39.21	1.0	50	0	78.4	73 - 122	38.96	0.64	20	
1,2,4-Trichlorobenzene	42.1	1.0	50	0	84.2	69 - 130	41.37	1.75	20	
1,2,4-Trimethylbenzene	43.66	1.0	50	0	87.3	76 - 124	43.59	0.145	20	
1,2-Dibromo-3-chloropropane	41.84	1.0	50	0	83.7	62 - 128	41.62	0.532	20	
1,2-Dibromoethane	43.28	1.0	50	0	86.6	77 - 121	43.82	1.25	20	
1,2-Dichlorobenzene	38.46	1.0	50	0	76.9	80 - 119	38.26	0.517	20 S	
1,2-Dichloroethane	43.96	1.0	50	1.942	84.0	73 - 128	43.58	0.862	20	
1,2-Dichloropropane	41.54	1.0	50	0	83.1	78 - 122	41.62	0.195	20	
1,3,5-Trimethylbenzene	44.52	1.0	50	0	89.0	75 - 124	44.04	1.08	20	
1,3-Dichlorobenzene	39.26	1.0	50	0	78.5	80 - 119	38.47	2.02	20 S	
1,3-Dichloropropane	39.37	1.0	50	0	78.7	80 - 119	40.21	2.1	20 S	
1,4-Dichlorobenzene	37.91	1.0	50	0	75.8	79 - 118	37.29	1.64	20 S	
2,2-Dichloropropane	43.11	1.0	50	0	86.2	60 - 139	44.91	4.07	20	
2-Butanone	90.7	2.0	100	0	90.7	56 - 143	92.32	1.77	20	
2-Chlorotoluene	42.31	1.0	50	0	84.6	79 - 122	42.52	0.499	20	
2-Hexanone	93.02	2.0	100	0	93.0	57 - 139	92.7	0.341	20	
4-Chlorotoluene	42.73	1.0	50	0	85.5	78 - 122	42.99	0.61	20	
4-Isopropyltoluene	38.76	1.0	50	0	77.5	77 - 127	38.85	0.239	20	
4-Methyl-2-pentanone	86.29	2.0	100	0	86.3	67 - 130	85.96	0.383	20	
Acetone	86.03	2.0	100	0	86.0	39 - 160	85.8	0.266	20	
Benzene	41.78	1.0	50	0	83.6	79 - 120	42.79	2.38	20	
Bromobenzene	38.2	1.0	50	0	76.4	80 - 120	37.85	0.933	20 S	
Bromochloromethane	43.77	1.0	50	0	87.5	78 - 123	46.43	5.9	20	
Bromodichloromethane	43.81	1.0	50	0	87.6	79 - 125	44.5	1.56	20	
Bromoform	46.58	1.0	50	0	93.2	66 - 130	47.64	2.25	20	
Bromomethane	41.19	1.0	50	0	82.4	53 - 141	36.6	11.8	20	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312659		Instrument: VOA2		Method: SW8260						
MSD	Sample ID: HS18030472-01MSD	Units: ug/L			Analysis Date: 16-Mar-2018 16:23					
Client ID: 35AWW19_030818	Run ID: VOA2_312659	SeqNo: 4477682	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	86.07	2.0	100	0	86.1	64 - 133	89.2	3.57	20	
Carbon tetrachloride	45.56	1.0	50	0	91.1	72 - 136	49.42	8.15	20	
Chlorobenzene	41.06	1.0	50	0	82.1	80 - 120	41.46	0.982	20	
Chloroethane	48	1.0	50	0	96.0	82 - 118	43.86	9	20	
Chloroform	39.68	1.0	50	0	79.4	79 - 124	41.06	3.41	20	
Chloromethane	37.43	1.0	50	0	74.9	50 - 139	40.5	7.89	20	
cis-1,2-Dichloroethene	42.71	1.0	50	0	85.4	78 - 123	44.07	3.13	20	
cis-1,3-Dichloropropene	44.11	1.0	50	0	88.2	75 - 124	44.61	1.13	20	
Dibromochloromethane	43.16	1.0	50	0	86.3	74 - 126	44.38	2.77	20	
Dibromomethane	45.18	1.0	50	0	90.4	79 - 123	45.52	0.759	20	
Dichlorodifluoromethane	36.78	1.0	50	0	73.6	32 - 152	38.78	5.31	20	
Ethylbenzene	47	1.0	50	0	94.0	79 - 121	47.94	1.97	20	
Hexachlorobutadiene	37.98	1.0	50	0	76.0	66 - 134	37.33	1.7	20	
Isopropylbenzene	42.71	1.0	50	0	85.4	72 - 131	43.96	2.9	20	
m,p-Xylene	82.12	2.0	100	0	82.1	80 - 121	84.19	2.49	20	
Methylene chloride	36.93	2.0	50	0	73.9	74 - 124	38.21	3.43	20	S
Naphthalene	47.08	1.0	50	0	94.2	61 - 128	44.6	5.41	20	
n-Butylbenzene	39.64	1.0	50	0	79.3	75 - 128	39.59	0.13	20	
n-Propylbenzene	38.91	1.0	50	0	77.8	76 - 126	38.87	0.0939	20	
o-Xylene	41.56	1.0	50	0	83.1	78 - 122	42.25	1.66	20	
sec-Butylbenzene	40.38	1.0	50	0	80.8	77 - 126	40.11	0.659	20	
Styrene	41.18	1.0	50	0	82.4	78 - 128	41.69	1.22	20	
tert-Butylbenzene	39.92	1.0	50	0	79.8	78 - 124	39.61	0.788	20	
Tetrachloroethene	44.23	1.0	50	0	88.5	74 - 129	45.99	3.9	20	
Toluene	39.9	1.0	50	0	79.8	80 - 121	41.1	2.96	20	S
trans-1,2-Dichloroethene	43.82	1.0	50	0	87.6	75 - 124	45.27	3.24	20	
trans-1,3-Dichloropropene	45.71	1.0	50	0	91.4	73 - 127	45.76	0.0971	20	
Trichloroethene	46.64	1.0	50	0	93.3	79 - 123	47.78	2.42	20	
Trichlorofluoromethane	44.64	1.0	50	0	89.3	65 - 141	44.84	0.443	20	
Vinyl chloride	40.98	1.0	50	0	82.0	58 - 137	42.85	4.45	20	
Surr: 1,2-Dichloroethane-d4	43.11	1.0	50	0	86.2	81 - 118	43.54	0.989	20	
Surr: 4-Bromofluorobenzene	49.75	1.0	50	0	99.5	85 - 114	50.42	1.34	20	
Surr: Dibromofluoromethane	41.21	1.0	50	0	82.4	80 - 119	40.9	0.765	20	
Surr: Toluene-d8	50.8	1.0	50	0	102	89 - 112	51.22	0.815	20	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

<b>Batch ID:</b> R312659	<b>Instrument:</b> VOA2	<b>Method:</b> SW8260
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The following samples were analyzed in this batch:

HS18030472-01	HS18030472-02	HS18030472-03	HS18030472-04
HS18030472-05	HS18030472-06		

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

## QC BATCH REPORT

Batch ID: R312915		Instrument: VOA2		Method: SW8260						
<b>MBLK</b>	Sample ID: <b>VBLKW-180321</b>	Units: <b>ug/L</b>			Analysis Date: <b>21-Mar-2018 22:13</b>					
Client ID:	Run ID: <b>VOA2_312915</b>	SeqNo: <b>4483532</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Benzene	0.50	1.0							U	
<i>Surr: 1,2-Dichloroethane-d4</i>	42.33	1.0	50	0	84.7	81 - 118				
<i>Surr: 4-Bromofluorobenzene</i>	48.85	1.0	50	0	97.7	85 - 114				
<i>Surr: Dibromofluoromethane</i>	43.64	1.0	50	0	87.3	80 - 119				
<i>Surr: Toluene-d8</i>	52.82	1.0	50	0	106	89 - 112				
<b>LCS</b>	Sample ID: <b>VLCSW-180321</b>	Units: <b>ug/L</b>			Analysis Date: <b>21-Mar-2018 21:24</b>					
Client ID:	Run ID: <b>VOA2_312915</b>	SeqNo: <b>4483530</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Benzene	44.16	1.0	50	0	88.3	79 - 120				
<i>Surr: 1,2-Dichloroethane-d4</i>	43.87	1.0	50	0	87.7	81 - 118				
<i>Surr: 4-Bromofluorobenzene</i>	50.86	1.0	50	0	102	85 - 114				
<i>Surr: Dibromofluoromethane</i>	41.88	1.0	50	0	83.8	80 - 119				
<i>Surr: Toluene-d8</i>	50.49	1.0	50	0	101	89 - 112				
<b>MS</b>	Sample ID: <b>HS18030822-05MS</b>	Units: <b>ug/L</b>			Analysis Date: <b>22-Mar-2018 01:05</b>					
Client ID:	Run ID: <b>VOA2_312915</b>	SeqNo: <b>4483539</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Benzene	44.92	1.0	50	0	89.8	79 - 120				
<i>Surr: 1,2-Dichloroethane-d4</i>	44.79	1.0	50	0	89.6	81 - 118				
<i>Surr: 4-Bromofluorobenzene</i>	49.82	1.0	50	0	99.6	85 - 114				
<i>Surr: Dibromofluoromethane</i>	42.25	1.0	50	0	84.5	80 - 119				
<i>Surr: Toluene-d8</i>	49.81	1.0	50	0	99.6	89 - 112				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID: R312915		Instrument: VOA2		Method: SW8260						
<b>MSD</b>	Sample ID: <b>HS18030822-05MSD</b>	Units: <b>ug/L</b>			Analysis Date: <b>22-Mar-2018 01:30</b>					
Client ID:	Run ID: <b>VOA2_312915</b>	SeqNo: <b>4483540</b>		PrepDate:		DF: <b>1</b>				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Benzene	41.99	1.0	50	0	84.0	79 - 120	44.92	6.73	20	
<i>Surr: 1,2-Dichloroethane-d4</i>	43.68	1.0	50	0	87.4	81 - 118	44.79	2.51	20	
<i>Surr: 4-Bromofluorobenzene</i>	49.72	1.0	50	0	99.4	85 - 114	49.82	0.201	20	
<i>Surr: Dibromofluoromethane</i>	42	1.0	50	0	84.0	80 - 119	42.25	0.598	20	
<i>Surr: Toluene-d8</i>	50.29	1.0	50	0	101	89 - 112	49.81	0.957	20	

The following samples were analyzed in this batch: HS18030472-02

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID:	126467	Instrument:	UV-2450	Method:	E365.3										
<b>MBLK</b>	Sample ID: <b>MBLK-126467</b>	Units:	mg/L	Analysis Date:	<b>22-Mar-2018 14:17</b>										
Client ID:	Run ID: <b>UV-2450_312946</b>	SeqNo:	<b>4484200</b>	PrepDate:	<b>21-Mar-2018</b>	DF:	<b>1</b>								
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual					
Phosphorus, Total (As P)	0.0250	0.0500								U					
<b>LCS</b>	Sample ID: <b>LCS-126467</b>	Units:	mg/L	Analysis Date:	<b>22-Mar-2018 14:17</b>										
Client ID:	Run ID: <b>UV-2450_312946</b>	SeqNo:	<b>4484199</b>	PrepDate:	<b>21-Mar-2018</b>	DF:	<b>1</b>								
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual					
Phosphorus, Total (As P)	0.244	0.0500	0.25	0	97.6	80 - 120									
<b>MS</b>	Sample ID: <b>HS18030917-01MS</b>	Units:	mg/L	Analysis Date:	<b>22-Mar-2018 14:17</b>										
Client ID:	Run ID: <b>UV-2450_312946</b>	SeqNo:	<b>4484197</b>	PrepDate:	<b>21-Mar-2018</b>	DF:	<b>1</b>								
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual					
Phosphorus, Total (As P)	0.345	0.0500	0.25	0.136	83.6	80 - 120									
<b>MSD</b>	Sample ID: <b>HS18030917-01MSD</b>	Units:	mg/L	Analysis Date:	<b>22-Mar-2018 14:17</b>										
Client ID:	Run ID: <b>UV-2450_312946</b>	SeqNo:	<b>4484198</b>	PrepDate:	<b>21-Mar-2018</b>	DF:	<b>1</b>								
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual					
Phosphorus, Total (As P)	0.352	0.0500	0.25	0.136	86.4	80 - 120	0.345	2.01	20						
<b>The following samples were analyzed in this batch:</b>															
<table border="1"> <tr> <td>HS18030472-01</td> <td>HS18030472-02</td> <td>HS18030472-03</td> <td>HS18030472-04</td> <td>HS18030472-05</td> </tr> </table>											HS18030472-01	HS18030472-02	HS18030472-03	HS18030472-04	HS18030472-05
HS18030472-01	HS18030472-02	HS18030472-03	HS18030472-04	HS18030472-05											

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID: R312300		Instrument: ManTech01		Method: SM2320B						
<b>MBLK</b>	Sample ID: <b>WBLKW1-180310</b>	Units: <b>mg/L</b>		Analysis Date: <b>10-Mar-2018 16:37</b>						
Client ID:	Run ID: <b>ManTech01_312300</b>	SeqNo: <b>4468968</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Alkalinity, Total (As CaCO3)	5.00	5.00							U	
<b>LCS</b>	Sample ID: <b>LCS-ALK1-180310</b>	Units: <b>mg/L</b>		Analysis Date: <b>10-Mar-2018 16:46</b>						
Client ID:	Run ID: <b>ManTech01_312300</b>	SeqNo: <b>4468969</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Alkalinity, Total (As CaCO3)	1096	5.00	1000	0	110	85 - 115				
<b>LCSD</b>	Sample ID: <b>LCSD-ALK1-180310</b>	Units: <b>mg/L</b>		Analysis Date: <b>10-Mar-2018 16:55</b>						
Client ID:	Run ID: <b>ManTech01_312300</b>	SeqNo: <b>4468970</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Alkalinity, Total (As CaCO3)	1097	5.00	1000	0	110	85 - 115	1096	0.135	20	
<b>DUP</b>	Sample ID: <b>HS18030437-01DUP</b>	Units: <b>mg/L</b>		Analysis Date: <b>10-Mar-2018 18:40</b>						
Client ID:	Run ID: <b>ManTech01_312300</b>	SeqNo: <b>4468983</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Alkalinity, Total (As CaCO3)	198.9	5.00					198.2	0.337	20	
The following samples were analyzed in this batch:										
HS18030472-01      HS18030472-02      HS18030472-03      HS18030472-04 HS18030472-05										

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID: R312607		Instrument: ICS2100		Method: SW9056						
<b>MBLK</b>	Sample ID: <b>WBLKW1-030918</b>	Units: <b>mg/L</b>			Analysis Date: <b>09-Mar-2018 19:59</b>					
Client ID:	Run ID: <b>ICS2100_312607</b>	SeqNo: <b>4476354</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Chloride	0.250	0.500							U	
Nitrogen, Nitrate (As N)	0.0500	0.100							U	
Nitrogen, Nitrite (As N)	0.0500	0.100							U	
Sulfate	0.250	0.500							U	
<b>LCS</b>	Sample ID: <b>WLCSW1-030918</b>	Units: <b>mg/L</b>			Analysis Date: <b>09-Mar-2018 20:20</b>					
Client ID:	Run ID: <b>ICS2100_312607</b>	SeqNo: <b>4476355</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Chloride	20.06	0.500	20	0	100	80 - 120				
Nitrogen, Nitrate (As N)	4.06	0.100	4	0	102	80 - 120				
Nitrogen, Nitrite (As N)	4.273	0.100	4	0	107	80 - 120				
Sulfate	20.32	0.500	20	0	102	80 - 120				
<b>LCSD</b>	Sample ID: <b>WLCSDW1-030918</b>	Units: <b>mg/L</b>			Analysis Date: <b>09-Mar-2018 20:35</b>					
Client ID:	Run ID: <b>ICS2100_312607</b>	SeqNo: <b>4476356</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Chloride	21.62	0.500	20	0	108	80 - 120	20.06	7.47	20	
Nitrogen, Nitrate (As N)	4.358	0.100	4	0	109	80 - 120	4.06	7.08	20	
Nitrogen, Nitrite (As N)	4.387	0.100	4	0	110	80 - 120	4.273	2.63	20	
Sulfate	21.83	0.500	20	0	109	80 - 120	20.32	7.19	20	
<b>MS</b>	Sample ID: <b>HS18030472-05MS</b>	Units: <b>mg/L</b>			Analysis Date: <b>09-Mar-2018 21:04</b>					
Client ID: <b>35AWW24_030818</b>	Run ID: <b>ICS2100_312607</b>	SeqNo: <b>4476358</b>		PrepDate:			DF: <b>1</b>			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual	
Chloride	130.3	0.500	10	122.8	75.7	80 - 120			SEO	
Nitrogen, Nitrate (As N)	2.124	0.100	2	0.11	101	80 - 120				
Nitrogen, Nitrite (As N)	2.259	0.100	2	0.213	102	80 - 120				
Sulfate	93.66	0.500	10	85.66	80.0	80 - 120			SO	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

Client: Bhate Environmental Associates, Inc.

Project: LHAAP-58

WorkOrder: HS18030472

## QC BATCH REPORT

Batch ID: R312607		Instrument: ICS2100		Method: SW9056						
MSD	Sample ID: HS18030472-05MSD	Units: mg/L			Analysis Date: 09-Mar-2018 21:19					
Client ID: 35AWW24_030818	Run ID: ICS2100_312607	SeqNo: 4476359	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	128.8	0.500	10	122.8	59.8	80 - 120	130.3	1.23	20	SEO
Nitrogen, Nitrate (As N)	2.129	0.100	2	0.11	101	80 - 120	2.124	0.235	20	
Nitrogen, Nitrite (As N)	2.301	0.100	2	0.213	104	80 - 120	2.259	1.84	20	
Sulfate	92.9	0.500	10	85.66	72.5	80 - 120	93.66	0.804	20	SO

The following samples were analyzed in this batch: HS18030472-01 HS18030472-02 HS18030472-03 HS18030472-04  
 HS18030472-05

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID:	R312695	Instrument:	WetChem_HS	Method:	E376.1					
<b>MBLK</b>	Sample ID: <b>MBLK-312695</b>	Units: <b>mg/L</b>	Analysis Date: <b>15-Mar-2018 16:58</b>							
Client ID:	Run ID: <b>WetChem_HS_312695</b>	SeqNo: <b>4478357</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Sulfide	1.00	1.00								U
<b>LCS</b>	Sample ID: <b>LCS-312695</b>	Units: <b>mg/L</b>	Analysis Date: <b>15-Mar-2018 16:58</b>							
Client ID:	Run ID: <b>WetChem_HS_312695</b>	SeqNo: <b>4478358</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Sulfide	24.24	1.00	25	0	97.0	80 - 120				
<b>LCSD</b>	Sample ID: <b>LCSD-312695</b>	Units: <b>mg/L</b>	Analysis Date: <b>15-Mar-2018 16:58</b>							
Client ID:	Run ID: <b>WetChem_HS_312695</b>	SeqNo: <b>4478359</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Sulfide	24.44	1.00	25	0	97.8	80 - 120	24.24	0.822	20	
<b>MS</b>	Sample ID: <b>HS18030472-05MS</b>	Units: <b>mg/L</b>	Analysis Date: <b>15-Mar-2018 16:58</b>							
Client ID: <b>35AWW24_030818</b>	Run ID: <b>WetChem_HS_312695</b>	SeqNo: <b>4478360</b>	PrepDate:	DF: <b>1</b>						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Sulfide	22.64	1.00	25	0.44	88.8	80 - 120				
The following samples were analyzed in this batch:										
HS18030472-01      HS18030472-02      HS18030472-03      HS18030472-04 HS18030472-05										

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QC BATCH REPORT**

Batch ID: R312878		Instrument: TOC_02		Method: E415.1													
<b>MBLK</b>	Sample ID: <b>WBLKW1-032018</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 19:47</b>													
Client ID:	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482712</b>		PrepDate:		DF: <b>1</b>											
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual								
Organic Carbon, Total	0.500	1.00							U								
<b>LCS</b>	Sample ID: <b>WLCSW1-032018</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 20:03</b>													
Client ID:	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482713</b>		PrepDate:		DF: <b>1</b>											
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual								
Organic Carbon, Total	10.15	1.00	10	0	102	80 - 120											
<b>LCSD</b>	Sample ID: <b>WLCSDW1-032018</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 20:18</b>													
Client ID:	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482714</b>		PrepDate:		DF: <b>1</b>											
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual								
Organic Carbon, Total	10.34	1.00	10	0	103	80 - 120	10.15	1.85	20								
<b>MS</b>	Sample ID: <b>HS18030472-05MS</b>	Units: <b>mg/L</b>		Analysis Date: <b>20-Mar-2018 23:17</b>													
Client ID: <b>35AWW24_030818</b>	Run ID: <b>TOC_02_312878</b>	SeqNo: <b>4482726</b>		PrepDate:		DF: <b>1</b>											
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual								
Organic Carbon, Total	10.7	1.00	10	1.447	92.5	80 - 120											
<b>The following samples were analyzed in this batch:</b>																	
<table border="1"> <tr> <td>HS18030472-01</td> <td>HS18030472-02</td> <td>HS18030472-03</td> <td>HS18030472-04</td> </tr> <tr> <td>HS18030472-05</td> <td></td> <td></td> <td></td> </tr> </table>										HS18030472-01	HS18030472-02	HS18030472-03	HS18030472-04	HS18030472-05			
HS18030472-01	HS18030472-02	HS18030472-03	HS18030472-04														
HS18030472-05																	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**ALS Group Houston, Corp**

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**WorkOrder:** HS18030472

**QUALIFIERS,  
ACRONYMS, UNITS**

<b>Qualifier</b>	<b>Description</b>
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

<b>Acronym</b>	<b>Description</b>
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

<b>Unit Reported</b>	<b>Description</b>
mg/L	Milligrams per Liter

**CERTIFICATIONS,ACCREDITATIONS & LICENSES**

<b>Agency</b>	<b>Number</b>	<b>Expire Date</b>
California	2919 2016-2018	31-Jul-2018
Illinois	004112	09-May-2018
Kentucky	123043	30-Apr-2018
Louisiana	03087 2017-2017	30-Jun-2018
North Dakota	R193 2017-2017	30-Apr-2018
Oklahoma	2017-088	31-Aug-2018
Texas	T104704231-17-19	30-Apr-2018
North Carolina	624-2018	31-Dec-2018

## ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.  
**Project:** LHAAP-58  
**Work Order:** HS18030472

**SAMPLE TRACKING**

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	MET014
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	MET014
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	VOA020
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-01	35AWW19_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	MET014
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	MET014
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	MET014
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	VOA020
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-02	35AWW06_030818	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	MET014
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	MET014
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	VOA020
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	Sub
HS18030472-03	35AWW06_030818_a	Login	3/9/2018 4:40:50 PM	JML	WET269
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	WET269
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	Sub
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	WET269
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	WET269
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	MET014
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	MET014
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	MET014
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	VOA020
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	Sub
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	Sub
HS18030472-04	35AWW23_030818	Login	3/9/2018 4:40:51 PM	JML	WET269

ALS Group Houston, Corp

Date: 30-Mar-18

**Client:** Bhate Environmental Associates, Inc.**Project:** LHAAP-58**Work Order:** HS18030472**SAMPLE TRACKING**

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HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	WET269
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	Sub
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	WET269
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	WET269
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	MET014
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	MET014
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	VOA020
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	Sub
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	Sub
HS18030472-05	35AWW24_030818	Login	3/9/2018 4:40:51 PM	JML	WET269
HS18030472-06	Trip Blank	Login	3/9/2018 4:40:51 PM	JML	VOA020

Date: 30-Mar-18

**Sample Receipt Checklist**

Client Name: Bhate Environmental  
 Work Order: HS18030472

Date/Time Received: **09-Mar-2018 08:50**  
 Received by: **PJM**

Checklist completed by: Pablo Martinez 9-Mar-2018 Reviewed by: RJ Modashia 12-Mar-2018  
 eSignature Date eSignature Date

Matrices: **WATER**Carrier name: **FedEx Priority Overnight**

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
TX1005 solids received in hermetically sealed vials?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	

Temperature(s)/Thermometer(s):

1.3C/0.7C UC/C

IR # 25

Cooler(s)/Kit(s):

25795

Date/Time sample(s) sent to storage:

3/9/2018 17:00

Water - VOA vials have zero headspace?

Yes No 

No VOA vials submitted

Water - pH acceptable upon receipt?

Yes No N/A 

pH adjusted?

Yes No N/A 

pH adjusted by:

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

Corrective Action:

1608 13th Avenue South, Suite 300

Birmingham Alabama 35205

Tel: 205-918-4000

Fax: 205-918-4050

### Chain of Custody and Analytical Request

**HS18030472**

Bhate Environmental Associates, Inc.

LHAAP-58

Facility/Base I.D.: LHAAP

Project/Site Name: LHAAP / Site 58

Client Name:

Collected by: Scott Beesinger



Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (2)	Sample Number (3)	Sample Matrix (4)	Number of containers	Sample Analysis Requested (5)										Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
									VOC	TOC	MEE / CO2	Anions / Alkalinity	Sulfide	Phosphorous	Dissolved Mn & Fe	Total Mn & Fe						
35Aww19_030818		08 MAR 2018	0815	-	N		WG	12	X	X	X	X	X	X	X	X						
35Aww06_030818		08 MAR 2018	0930	-	N		WG	12	X	X	X	X	X	X	X	X						
35Aww06_030818_a		08 MAR 2018	0930	-	FD		WG	12	X	X	X	X	X	X	X	X						
35Aww23_030818		08 MAR 2018	1100	-	N		WG	12	X	X	X	X	X	X	X	X						
35Aww24_030818		08 MAR 2018	1210	-	N		WG	12	X	X	X	X	X	X	X	X						
Trip BLANK		08 MAR 2018		-	TB		W	2	X													

COMMENTS:


**Custody Transfers Prior to Receipt by Laboratory**

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
<i>Scott Beesinger</i>	3/8/18	1430			
2. _____					
3. _____					

Sample Delivery Details / Laboratory Receipt	
Delivered Directly to Lab: _____	Shipped _____
Method of Shipment: _____	
Fed _____	Ex _____ Airbill _____
Analytical Lab: ALS 10450 Stancliff Rd, Suite 210 Houston, TX 77099 (281) 530-5656	Number: _____
ATTN: SONIA WEST	Lab Recipient: _____ Delivery Date/Time: _____

- Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)
- Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)
- Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)
- Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks
- Sample Analysis Requested: Analytical method requested and number of containers provided for each.
- Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment Blank Lot Control

25795 UC  
1.3C  
IR25 CF-0.6

 <b>ALS</b> 10450 Stancliff Rd., Suite 210 Houston, Texas 77099 Tel. +1 281 530 5656 Fax. +1 281 530 5887	<b>CUSTODY SEAL</b>		Seal Broken By: <i>SM</i>
	Date: <i>3/8/18</i>	Time: <i>12:30</i>	Date:
	Name: <i>Scott Bessinger</i>	Company: <i>BATS</i>	<i>03/09/18</i>

*25795* MAR 09 2018

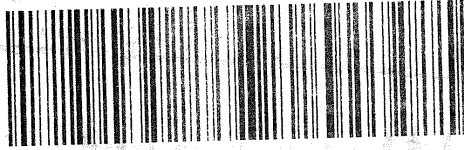
FedEx  
TRACKING 7376 9752 7521

FRI - 09 MAR 10:30A  
PRIORITY OVERNIGHT

**AB SGRA**

*25795*

77099  
TX-US  
IAH



FID 162785 09MAR18 G6GA 546C1/07F5/0CBA



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## LABORATORY REPORT

March 23, 2018

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road Suite 210  
Houston, TX 77099-4338

**RE: HS18030472**

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on March 14, 2018. For your reference, these analyses have been assigned our service request number P1801237.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kelly Horiuchi at 3:48 pm, Mar 23, 2018

Kelly Horiuchi  
Laboratory Director



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F: +1 805 526 7270  
[www.alsglobal.com](http://www.alsglobal.com)

Client: ALS Laboratory Group  
Project: HS18030472

Service Request No: P1801237

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### CASE NARRATIVE

The samples were received intact under chain of custody on March 14, 2018 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

#### Carbon Dioxide Analysis

The samples were analyzed for carbon dioxide using a gas chromatograph equipped with a thermal conductivity detector (TCD). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least four hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gas (carbon dioxide) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175 as described in laboratory SOP VOA-DISGAS. This analyte is included on the laboratory's NELAP and DoD-ELAP scope of accreditation.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	<a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a>	AZ0694
Florida DOH (NELAP)	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E871020
Louisiana DEQ (NELAP)	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	05071
Maine DHHS	<a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>	2016036
Minnesota DOH (NELAP)	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	1347317
New Jersey DEP (NELAP)	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	CA009
New York DOH (NELAP)	<a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>	11221
Oregon PHD (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	4068-005
Pennsylvania DEP	<a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>	68-03307 (Registration)
PJLA (DoD ELAP)	<a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>	65818 (Testing)
Texas CEQ (NELAP)	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704413-17-8
Utah DOH (NELAP)	<a href="http://health.utah.gov/lab/environmental-lab-certification/">http://health.utah.gov/lab/environmental-lab-certification/</a>	CA01627201 7-8
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

## ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: ALS Laboratory Group  
 Project ID: HS18030472

Service Request: P1801237

Date Received: 3/14/2018  
 Time Received: 09:30

RSK 175 - CO2

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
35AWW19_030818	P1801237-001	Water	3/8/2018	08:15	X
35AWW06_030818	P1801237-002	Water	3/8/2018	09:30	X
35AWW06_030818_a	P1801237-003	Water	3/8/2018	09:30	X
35AWW23_030818	P1801237-004	Water	3/8/2018	11:00	X
35AWW24_030818	P1801237-005	Water	3/8/2018	12:10	X

P1801237



10450 Stancliff Rd, Ste 210  
Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887  
www.alsglobal.com

## Subcontract Chain of Custody

COC ID: 8738

### SUBCONTRACT TO:

ALS Environmental  
2655 Park Center Drive, Suite A  
Simi Valley, CA 93065

Phone: +1 805 526 7161

### CUSTOMER INFORMATION:

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

### INVOICE INFORMATION:

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** HS18030472  
**TSR:** Danielle Winnings

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	HS18030472-01	35AWW19_030818	Water	08 Mar 2018 08:15
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
2.	HS18030472-02	35AWW06_030818	Water	08 Mar 2018 09:30
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
3.	HS18030472-03	35AWW06_030818_a	Water	08 Mar 2018 09:30
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
4.	HS18030472-04	35AWW23_030818	Water	08 Mar 2018 11:00
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
5.	HS18030472-05	35AWW24_030818	Water	08 Mar 2018 12:10
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018

**Comments:** Please analyze for the analysis listed above.  
Send report to the emails shown above.

**QC Level:** DOD IV (DoD Data Package)



### Subcontract Chain of Custody

COC ID: 8738

Relinquished By: J. MAKIYAN

Date/Time: 3/13/18 18:00

Received By: [Signature]

Date/Time: 3-14-18 0930

Cooler ID(s): \_\_\_\_\_

Temperature(s): \_\_\_\_\_

30  
LOT  
ICE

### Neat vials for CO2 analysis



## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

Client: **ALS Laboratory Group**Client Project ID: **HS18030472**

ALS Project ID: P1801237

**Carbon Dioxide**

Test Code: RSK 175

Instrument ID: HP5890A/GC10/TCD

Analyst: Wade Henton

Matrix: Water

Test Notes:

Date(s) Collected: 3/8/18

Date Received: 3/14/18

Date Analyzed: 3/22/18

Client Sample ID	ALS Sample ID	Injection Volume ml(s)	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
35AWW19_030818	P1801237-001	0.10	<b>97,000</b>	1,000	760	370	
35AWW06_030818	P1801237-002	0.10	<b>500,000</b>	1,000	760	370	
35AWW06_030818_a	P1801237-003	0.050	<b>310,000</b>	2,000	1,500	740	
35AWW23_030818	P1801237-004	0.10	<b>500,000</b>	1,000	760	370	
35AWW24_030818	P1801237-005	0.10	<b>290,000</b>	1,000	760	370	
Method Control Sample	P180322-MB	0.10	760	1,000	760	370	<b>U</b>

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS18030472

ALS Project ID: P1801237  
 ALS Sample ID: P180322-DLCS

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/TCD  
 Analyst: Wade Henton  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 3/22/18  
 Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount		Result <sub>i</sub>		% Recovery		DOD		Data Qualifier
		LCS / DLCS	LCS	DLCS	LCS	DLCS	Acceptance	RPD	RPD	
		ug/L	ug/L	ug/L	LCS	DLCS	Limits		Limit	
124-38-9	Carbon Dioxide	22,900	24,400	22,800	107	100	80-122	7	15	

<sub>i</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.



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## LABORATORY REPORT

March 23, 2018

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road Suite 210  
Houston, TX 77099-4338

**RE: HS18030472**

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on March 10, 2018. For your reference, these analyses have been assigned our service request number P1801167.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kelly Horiuchi at 3:48 pm, Mar 23, 2018

Kelly Horiuchi  
Laboratory Director



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Simi Valley, CA 93065  
T: +1 805 526 7161  
F: +1 805 526 7270  
[www.alsglobal.com](http://www.alsglobal.com)

Client: ALS Laboratory Group  
Project: HS18030472

Service Request No: P1801167

---

### CASE NARRATIVE

The samples were received intact under chain of custody on March 10, 2018 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

#### Methane, Ethene and Ethane Analysis

The samples were also analyzed for methane, ethene and ethane using a gas chromatograph equipped with a flame ionization detector (FID). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least two hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (methane, ethene and ethane) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP accreditation.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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[www.alsglobal.com](http://www.alsglobal.com)

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	<a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a>	AZ0694
Florida DOH (NELAP)	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E871020
Louisiana DEQ (NELAP)	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	05071
Maine DHHS	<a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>	2016036
Minnesota DOH (NELAP)	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	1347317
New Jersey DEP (NELAP)	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	CA009
New York DOH (NELAP)	<a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>	11221
Oregon PHD (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	4068-005
Pennsylvania DEP	<a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>	68-03307 (Registration)
PJLA (DoD ELAP)	<a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>	65818 (Testing)
Texas CEQ (NELAP)	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704413-17-8
Utah DOH (NELAP)	<a href="http://health.utah.gov/lab/environmental-lab-certification/">http://health.utah.gov/lab/environmental-lab-certification/</a>	CA01627201 7-8
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

## ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: ALS Laboratory Group  
 Project ID: HS18030472

Service Request: P1801167

Date Received: 3/10/2018  
 Time Received: 10:00

RSK 175 - Gases

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
35AWW19_030818	P1801167-001	Water	3/8/2018	08:15	X
35AWW06_030818	P1801167-002	Water	3/8/2018	09:30	X
35AWW06_030818_a	P1801167-003	Water	3/8/2018	09:30	X
35AWW23_030818	P1801167-004	Water	3/8/2018	11:00	X
35AWW24_030818	P1801167-005	Water	3/8/2018	12:10	X



P1301167

10450 Stancliff Rd, Ste 210  
Houston, TX 77099  
**T:** +1 281 530 5656  
**F:** +1 281 530 5887  
[www.alsglobal.com](http://www.alsglobal.com)

## Subcontract Chain of Custody

**COC ID: 8738**
**SUBCONTRACT TO:**

ALS Environmental  
2655 Park Center Drive, Suite A  
Simi Valley, CA 93065

**Phone:** +1 805 526 7161

**CUSTOMER INFORMATION:**

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

**INVOICE INFORMATION:**

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** HS18030472  
**TSR:** Danielle Winnings

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	HS18030472-01	35AWW19_030818	Water	08 Mar 2018 08:15
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
2.	HS18030472-02	35AWW06_030818	Water	08 Mar 2018 09:30
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
3.	HS18030472-03	35AWW06_030818_a	Water	08 Mar 2018 09:30
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
4.	HS18030472-04	35AWW23_030818	Water	08 Mar 2018 11:00
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018
5.	HS18030472-05	35AWW24_030818	Water	08 Mar 2018 12:10
	MEE plus CO2 Sub to ALS SimiValley			23 Mar 2018

**Comments:** Please analyze for the analysis listed above.  
Send report to the emails shown above.

**QC Level:** DOD IV (DoD Data Package)



P1801167

### Subcontract Chain of Custody

COC ID: 8738

Relinquished By: J. Maxwell  
Received By: Samantha Affen  
Cooler ID(s): \_\_\_\_\_

Date/Time: 3/9/18 18:00  
Date/Time: 3/10/18 1000  
Temperature(s): 4°C

P1901167



10450 Stancliff Rd, Ste 210  
 Houston, TX 77099  
**T:** +1 281 530 5656  
**F:** +1 281 530 5887  
**www.alsglobal.com**

## Purchase Order

**PO: HS18030472**

### VENDOR:

ALS Environmental  
 2655 Park Center Drive, Suite A  
 Simi Valley, CA 93065

**Phone:** +1 805 526 7161

### CUSTOMER INFORMATION:

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

### INVOICE INFORMATION:

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** 8738  
**TSR:** Danielle Winnings

Item	Catalog No	Unit Price	Quantity	Ext Price
1. MEE plus CO2 Sub to ALS SimiValley	NA	\$41.25	5	\$206.25
<b>Order Total:</b>				\$206.25



## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 35AWW19\_030818  
**Client Project ID:** HS18030472

ALS Project ID: P1801167  
 ALS Sample ID: P1801167-001

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/8/18  
 Date Received: 3/10/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 35AWW06\_030818  
**Client Project ID:** HS18030472

ALS Project ID: P1801167  
 ALS Sample ID: P1801167-002

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/8/18  
 Date Received: 3/10/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 35AWW06\_030818\_a  
**Client Project ID:** HS18030472

ALS Project ID: P1801167  
 ALS Sample ID: P1801167-003

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/8/18  
 Date Received: 3/10/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 35AWW23\_030818  
**Client Project ID:** HS18030472

ALS Project ID: P1801167  
 ALS Sample ID: P1801167-004

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/8/18  
 Date Received: 3/10/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 35AWW24\_030818  
**Client Project ID:** HS18030472

ALS Project ID: P1801167  
 ALS Sample ID: P1801167-005

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: 3/8/18  
 Date Received: 3/10/18  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Method Control Sample  
**Client Project ID:** HS18030472

ALS Project ID: P1801167  
 ALS Sample ID: P180314-MB

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	U
74-85-1	Ethene	0.55	1.0	0.55	0.24	U
74-84-0	Ethane	0.47	0.60	0.47	0.16	U

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS18030472

ALS Project ID: P1801167  
 ALS Sample ID: P180314-LCS  
 P180314-DLCS

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Mike Conejo  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 3/14/18  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Spike Amount	Result <sub>1</sub>		% Recovery		DOD	RPD	RPD	Data
		LCS / DLCS µg/L	LCS µg/L	DLCS µg/L	LCS	DLCS	Acceptance Limits			
74-82-8	Methane	2.50	2.31	2.33	<b>92</b>	<b>93</b>	73-125	1	12	
74-85-1	Ethene	4.37	4.82	4.84	<b>110</b>	<b>111</b>	72-133	0.9	7	
74-84-0	Ethane	4.69	4.70	4.81	<b>100</b>	<b>103</b>	74-131	3	6	

<sub>1</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.



March 29, 2018

Service Request No:R1802087

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road  
Suite 210  
Houston, TX 77099-4338

**Laboratory Results for: LHAAP Site 58 HS18030472**

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory March 09, 2018  
For your reference, these analyses have been assigned our service request number **R1802087**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at [Janice.Jaeger@alsglobal.com](mailto:Janice.Jaeger@alsglobal.com).

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

Janice Jaeger  
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
PHONE +1 585 288 5380 | FAX +1 585 288 8475  
ALS Group USA, Corp.  
dba ALS Environmental




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## Narrative Documents

**ALS Environmental—Rochester Laboratory**  
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)



**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Received:** 03/09/2018

**CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV, validation deliverables including all summary forms and associated raw data. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

**Sample Receipt:**

Five water samples were received for analysis at ALS Environmental on 03/09/2018. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

**Semivoa GC:**

Method Organic Acids, 03/14/2018: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

Method Organic Acids, 03/14/2018: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.

**General Chemistry:**

Ferrous Iron samples were analyzed upon receipt in the laboratory.

Approved by \_\_\_\_\_

Date 03/26/2018



## SAMPLE DETECTION SUMMARY

CLIENT ID: 35AWW19_030818		Lab ID: R1802087-001					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	1.10		0.03	0.10	mg/L	SM 3500-Fe B.4.c	
CLIENT ID: 35AWW06_030818		Lab ID: R1802087-002					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	0.08	J	0.03	0.10	mg/L	SM 3500-Fe B.4.c	
CLIENT ID: 35AWW06_030818_A		Lab ID: R1802087-003					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	0.12		0.03	0.10	mg/L	SM 3500-Fe B.4.c	
CLIENT ID: 35AWW23_030818		Lab ID: R1802087-004					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	0.13		0.03	0.10	mg/L	SM 3500-Fe B.4.c	
CLIENT ID: 35AWW24_030818		Lab ID: R1802087-005					
Analyte	Results	Flag	MDL	PQL	Units	Method	
Iron, Divalent (Ferrous Iron)	0.33		0.03	0.10	mg/L	SM 3500-Fe B.4.c	



## Sample Receipt Information

**ALS Environmental—Rochester Laboratory**  
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150

**Service Request:**R1802087

**SAMPLE CROSS-REFERENCE**

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1802087-001	35AWW19_030818	3/8/2018	0815
R1802087-002	35AWW06_030818	3/8/2018	0930
R1802087-003	35AWW06_030818_A	3/8/2018	0930
R1802087-004	35AWW23_030818	3/8/2018	1100
R1802087-005	35AWW24_030818	3/8/2018	1210





# Cooler Receipt and Preservation Check Form

R1802087

ALS Group USA, Corp.  
LHAAP Site 68

00897841

5



Project/Client Bhate Env.

Folder Number R1802087

Cooler received on 3-9-18

by: RE

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<input checked="" type="radio"/> Y	<input type="radio"/> N
2	Custody papers properly completed (ink, signed)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<input checked="" type="radio"/> Y	<input type="radio"/> N

5a	Perchlorate samples have required headspace?	Y	<input checked="" type="radio"/> NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	Y	<input checked="" type="radio"/> NA
6	Where did the bottles originate?	<u>ALS/ROC</u>	<u>CLIENT</u>
7	Soil VOA received as: Bulk Encore 5035set		<input checked="" type="radio"/> NA

8. Temperature Readings

Date: 3-9-18

Time: 10:28

ID: IR#7 IR#9

From: Temp Blank

Sample Bottle

Observed Temp (°C)	<u>3.4</u>							
Correction Factor (°C)	<u>0</u>							
Corrected Temp (°C)	<u>3.4</u>							
Temp from: Type of bottle	<u>1</u>							
Within 0-6°C?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N
If <0°C, were samples frozen?	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N

If out of Temperature, note packing/ice condition: \_\_\_\_\_ Ice melted Poorly Packed (described below) Same Day Rule  
 & Client Approval to Run Samples: \_\_\_\_\_ Standing Approval Client aware at drop-off Client notified by: \_\_\_\_\_

All samples held in storage location: R-002 by RE on 3-9-18 at 10:31  
 5035 samples placed in storage location: \_\_\_\_\_ by \_\_\_\_\_ on \_\_\_\_\_ at \_\_\_\_\_

Cooler Breakdown: Date: 3-9-18 Time: 13:39 by: RE

- 9. Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- 10. Did all bottle labels and tags agree with custody papers? YES NO
- 11. Were correct containers used for the tests indicated? YES NO
- 12. Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- 13. Air Samples: Cassettes / Tubes Intact \_\_\_\_\_ Canisters Pressurized \_\_\_\_\_ Tedlar® Bags Inflated N/A

pH	Lot of test paper	Reagent	Preserved?		Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
			Yes	No						
≥12		NaOH								
≤2		HNO <sub>3</sub>								
≤2		H <sub>2</sub> SO <sub>4</sub>								
<4		NaHSO <sub>4</sub>								
Residual Chlorine (-)		For CN Phenol and 522			If +, contact PM to add Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (CN), ascorbic (phenol).					
		Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	-	-						
		ZnAcetate	-	-						
		HCl	**	**	<u>Client Bottles</u>					

\*\*Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: 101617-1BMC, 80617-02

Explain all Discrepancies/ Other Comments:

H<sub>3</sub>PO<sub>4</sub> Lot 185422 exp 01/19

CLRES	BULK
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

Labels secondary reviewed by: RE

PC Secondary Review: MM 3/12/18 \*significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter

Internal Chain of Custody Report

**Client:** ALS Laboratory Group  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150

**Service Request:** R1802087

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
<b>R1802087-001.01</b>					
	SM 3500-Fe B.4.c	3/9/2018	1341	SMO / GESMERIAN	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<b>R1802087-001.02</b>					
	Organic Acids	3/9/2018	1341	SMO / GESMERIAN	
		3/9/2018	1342	R-002 / GESMERIAN	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	
<b>R1802087-002.01</b>					
	SM 3500-Fe B.4.c	3/9/2018	1341	SMO / GESMERIAN	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<b>R1802087-002.02</b>					
	Organic Acids	3/9/2018	1341	SMO / GESMERIAN	
		3/9/2018	1342	R-002 / GESMERIAN	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	
<b>R1802087-003.01</b>					
	SM 3500-Fe B.4.c	3/9/2018	1341	SMO / GESMERIAN	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<b>R1802087-003.02</b>					
	Organic Acids	3/9/2018	1341	SMO / GESMERIAN	
		3/9/2018	1342	R-002 / GESMERIAN	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	
<b>R1802087-004.01</b>					
	SM 3500-Fe B.4.c	3/9/2018	1341	SMO / GESMERIAN	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<b>R1802087-004.02</b>					
	Organic Acids	3/9/2018	1341	SMO / GESMERIAN	

Internal Chain of Custody Report

**Client:** ALS Laboratory Group  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150

**Service Request:** R1802087

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
	Organic Acids	3/9/2018	1342	R-002 / GESMERIAN	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	
<hr/>					
<b>R1802087-005.01</b>					
	SM 3500-Fe B.4.c	3/9/2018	1341	SMO / GESMERIAN	
		3/13/2018	1416	RT000261 / DWARD	
		3/13/2018	1417	R-015 / DWARD	
<hr/>					
<b>R1802087-005.02</b>					
	Organic Acids	3/9/2018	1341	SMO / GESMERIAN	
		3/9/2018	1342	R-002 / GESMERIAN	
		3/14/2018	1337	In Lab / BALLGEIER	
		3/14/2018	1431	R-002 / BALLGEIER	



## Miscellaneous Forms

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## REPORT QUALIFIERS AND DEFINITIONS

<p><b>U</b> Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p><b>J</b> Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration &gt;40% difference between two GC columns (pesticides/Aroclors).</p> <p><b>B</b> Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p><b>E</b> Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p><b>E</b> Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p><b>D</b> Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p><b>*</b> Indicates that a quality control parameter has exceeded laboratory limits. Under the "Notes" column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p><b>H</b> Analysis was performed out of hold time for tests that have an "immediate" hold time criteria.</p> <p><b>#</b> Spike was diluted out.</p>	<p><b>+</b> Correlation coefficient for MSA is &lt;0.995.</p> <p><b>N</b> Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p><b>N</b> Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p><b>S</b> Concentration has been determined using Method of Standard Additions (MSA).</p> <p><b>W</b> Post-Digestion Spike recovery is outside control limits and the sample absorbance is &lt;50% of the spike absorbance.</p> <p><b>P</b> Concentration &gt;40% difference between the two GC columns.</p> <p><b>C</b> Confirmed by GC/MS</p> <p><b>Q</b> DoD reports: indicates a pesticide/Aroclor is not confirmed (<math>\times 100\%</math> Difference between two GC columns).</p> <p><b>X</b> See Case Narrative for discussion.</p> <p><b>MRL</b> Method Reporting Limit. Also known as:</p> <p><b>LOQ</b> Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p><b>MDL</b> Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p><b>LOD</b> Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p><b>ND</b> Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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### Rochester Lab ID # for State Certifications<sup>1</sup>

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Approved	New Jersey ID # NY004	294100 A/B
DoD ELAP #65817	New York ID # 10145	Pennsylvania ID# 68-786
Florida ID # E87674	North Carolina #676	Rhode Island ID # 158
		Virginia #460167

<sup>1</sup> Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental>

## ALS Laboratory Group

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### Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Analyst Summary report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150

**Service Request:** R1802087

**Sample Name:** 35AWW19\_030818  
**Lab Code:** R1802087-001  
**Sample Matrix:** Water

**Date Collected:** 03/8/18  
**Date Received:** 03/9/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON

**Sample Name:** 35AWW06\_030818  
**Lab Code:** R1802087-002  
**Sample Matrix:** Water

**Date Collected:** 03/8/18  
**Date Received:** 03/9/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON

**Sample Name:** 35AWW06\_030818\_A  
**Lab Code:** R1802087-003  
**Sample Matrix:** Water

**Date Collected:** 03/8/18  
**Date Received:** 03/9/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON

**Sample Name:** 35AWW23\_030818  
**Lab Code:** R1802087-004  
**Sample Matrix:** Water

**Date Collected:** 03/8/18  
**Date Received:** 03/9/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON

Analyst Summary report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150

**Service Request:** R1802087

**Sample Name:** 35AWW24\_030818  
**Lab Code:** R1802087-005  
**Sample Matrix:** Water

**Date Collected:** 03/8/18  
**Date Received:** 03/9/18

**Analysis Method**  
Organic Acids  
SM 3500-Fe B.4.c

**Extracted/Digested By**

**Analyzed By**  
BALLGEIER  
MROGERSON



## INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

### Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

### Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.

RIGHT SOLUTIONS | RIGHT PARTNER



# Sample Results

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## Semivolatile Organic Compounds by GC

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Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Collected:** 03/08/18 08:15  
**Date Received:** 03/09/18 09:55

**Sample Name:** 35AWW19\_030818  
**Lab Code:** R1802087-001

**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 18:33	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 18:33	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 18:33	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 18:33	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 18:33	

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Collected:** 03/08/18 09:30  
**Date Received:** 03/09/18 09:55

**Sample Name:** 35AWW06\_030818  
**Lab Code:** R1802087-002

**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 19:10	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 19:10	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 19:10	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 19:10	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 19:10	

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW06\_030818\_A  
**Lab Code:** R1802087-003

**Service Request:** R1802087  
**Date Collected:** 03/08/18 09:30  
**Date Received:** 03/09/18 09:55  
**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 19:45	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 19:45	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 19:45	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 19:45	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 19:45	

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW23\_030818  
**Lab Code:** R1802087-004

**Service Request:** R1802087  
**Date Collected:** 03/08/18 11:00  
**Date Received:** 03/09/18 09:55

**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 20:27	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 20:27	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 20:27	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 20:27	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 20:27	

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Collected:** 03/08/18 12:10  
**Date Received:** 03/09/18 09:55

**Sample Name:** 35AWW24\_030818  
**Lab Code:** R1802087-005

**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 21:45	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 21:45	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 21:45	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 21:45	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 21:45	



## General Chemistry

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Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW19\_030818  
**Lab Code:** R1802087-001

**Service Request:** R1802087  
**Date Collected:** 03/08/18 08:15  
**Date Received:** 03/09/18 09:55

**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	<b>1.10</b>	mg/L	0.10	0.08	0.03	1	03/09/18 16:32	*

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW06\_030818  
**Lab Code:** R1802087-002

**Service Request:** R1802087  
**Date Collected:** 03/08/18 09:30  
**Date Received:** 03/09/18 09:55  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	<b>0.08 J</b>	mg/L	0.10	0.08	0.03	1	03/09/18 16:32	*

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW06\_030818\_A  
**Lab Code:** R1802087-003

**Service Request:** R1802087  
**Date Collected:** 03/08/18 09:30  
**Date Received:** 03/09/18 09:55  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	0.12	mg/L	0.10	0.08	0.03	1	03/09/18 16:32	*

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW23\_030818  
**Lab Code:** R1802087-004

**Service Request:** R1802087  
**Date Collected:** 03/08/18 11:00  
**Date Received:** 03/09/18 09:55  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	<b>0.13</b>	mg/L	0.10	0.08	0.03	1	03/09/18 16:32	*

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** 35AWW24\_030818  
**Lab Code:** R1802087-005

**Service Request:** R1802087  
**Date Collected:** 03/08/18 12:10  
**Date Received:** 03/09/18 09:55  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	0.33	mg/L	0.10	0.08	0.03	1	03/09/18 16:32	*



## QC Summary Forms

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## Semivolatile Organic Compounds by GC

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[www.alsglobal.com](http://www.alsglobal.com)

ALS Group USA, Corp.  
dba ALS Environmental

## QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Collected:** 03/08/18  
**Date Received:** 03/09/18  
**Date Analyzed:** 03/14/18

## Duplicate Matrix Spike Summary

## Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

**Sample Name:** 35AWW24\_030818  
**Lab Code:** R1802087-005  
**Analysis Method:** Organic Acids

**Units:** mg/L  
**Basis:** NA

Analyte Name	Sample Result	Matrix Spike RQ1802335-04			Duplicate Matrix Spike RQ1802335-05			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Pyruvic Acid	ND U	1.87	2.04	92	1.86	2.04	91	70-130	<1	30
Acetic Acid	ND U	19.7	20.0	98	19.6	20.0	98	70-130	<1	30
Butanoic Acid (Butyric Acid)	ND U	20.6	20.1	103	20.5	20.1	102	70-130	<1	30
Lactic Acid	ND U	18.4	20.0	92	18.3	20.0	91	70-130	<1	30
Propionic Acid	ND U	30.4	20.0	152 *	29.9	20.0	149 *	70-130	2	30

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.  
dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Analyzed:** 03/14/18 14:45

## Method Blank Summary

## Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

**Sample Name:** Method Blank **Instrument ID:** R-HPLC-05  
**Lab Code:** RQ1802335-01 **File ID:** I:\ACQUADATA\hplc05\data\031418\A0001466.D\  
**Analysis Method:** Organic Acids **Analysis Lot:** 583688

This Method Blank applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Lab Control Sample	RQ1802335-02	I:\ACQUADATA\hplc05\data\031418\A0001467.D\	03/14/18 15:20
Duplicate Lab Control Sample	RQ1802335-03	I:\ACQUADATA\hplc05\data\031418\A0001468.D\	03/14/18 16:01
35AWW19_030818	R1802087-001	I:\ACQUADATA\hplc05\data\031418\A0001472.D\	03/14/18 18:33
35AWW06_030818	R1802087-002	I:\ACQUADATA\hplc05\data\031418\A0001473.D\	03/14/18 19:10
35AWW06_030818_A	R1802087-003	I:\ACQUADATA\hplc05\data\031418\A0001474.D\	03/14/18 19:45
35AWW23_030818	R1802087-004	I:\ACQUADATA\hplc05\data\031418\A0001475.D\	03/14/18 20:27
35AWW24_030818	R1802087-005	I:\ACQUADATA\hplc05\data\031418\A0001477.D\	03/14/18 21:45
35AWW24_030818	RQ1802335-04	I:\ACQUADATA\hplc05\data\031418\A0001478.D\	03/14/18 22:20
35AWW24_030818	RQ1802335-05	I:\ACQUADATA\hplc05\data\031418\A0001479.D\	03/14/18 22:58

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** Method Blank  
**Lab Code:** RQ1802335-01

**Service Request:** R1802087  
**Date Collected:** NA  
**Date Received:** NA  
**Units:** mg/L  
**Basis:** NA

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Analysis Method:** Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	03/14/18 14:45	
Acetic Acid	ND U	4.0	2.0	1.0	1	03/14/18 14:45	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	03/14/18 14:45	
Lactic Acid	ND U	2.0	1.0	0.14	1	03/14/18 14:45	
Propionic Acid	ND U	2.0	1.0	0.19	1	03/14/18 14:45	

ALS Group USA, Corp.  
dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Analyzed:** 03/14/18 15:20

**Lab Control Sample Summary**

**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Sample Name:** Lab Control Sample      **Instrument ID:** R-HPLC-05  
**Lab Code:** RQ1802335-02      **File ID:** I:\ACQUADATA\hplc05\data\031418\A0001467.D\  
**Analysis Method:** Organic Acids      **Analysis Lot:** 583688

This Lab Control Sample applies to the following analyses.

<b>Sample Name</b>	<b>Lab Code</b>	<b>File ID</b>	<b>Date Analyzed</b>
Method Blank	RQ1802335-01	I:\ACQUADATA\hplc05\data\031418\A0001466.D\	03/14/18 14:45
Duplicate Lab Control Sample	RQ1802335-03	I:\ACQUADATA\hplc05\data\031418\A0001468.D\	03/14/18 16:01
35AWW19_030818	R1802087-001	I:\ACQUADATA\hplc05\data\031418\A0001472.D\	03/14/18 18:33
35AWW06_030818	R1802087-002	I:\ACQUADATA\hplc05\data\031418\A0001473.D\	03/14/18 19:10
35AWW06_030818_A	R1802087-003	I:\ACQUADATA\hplc05\data\031418\A0001474.D\	03/14/18 19:45
35AWW23_030818	R1802087-004	I:\ACQUADATA\hplc05\data\031418\A0001475.D\	03/14/18 20:27
35AWW24_030818	R1802087-005	I:\ACQUADATA\hplc05\data\031418\A0001477.D\	03/14/18 21:45
35AWW24_030818	RQ1802335-04	I:\ACQUADATA\hplc05\data\031418\A0001478.D\	03/14/18 22:20
35AWW24_030818	RQ1802335-05	I:\ACQUADATA\hplc05\data\031418\A0001479.D\	03/14/18 22:58

ALS Group USA, Corp.  
dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Analyzed:** 03/14/18

**Duplicate Lab Control Sample Summary**  
**Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time**

**Units:**mg/L

**Basis:**NA

Analyte Name	Analytical Method	Lab Control Sample			Duplicate Lab Control Sample			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Pyruvic Acid	Organic Acids	1.98	2.04	97	1.98	2.04	97	70-130	<1	30
Acetic Acid	Organic Acids	19.8	20.0	99	19.8	20.0	99	70-130	<1	30
Butanoic Acid (Butyric Acid)	Organic Acids	20.8	20.1	104	20.6	20.1	103	70-130	<1	30
Lactic Acid	Organic Acids	18.6	20.0	93	18.6	20.0	93	70-130	<1	30
Propionic Acid	Organic Acids	30.6	20.0	153 *	30.3	20.0	151 *	70-130	<1	30



## General Chemistry

**ALS Environmental—Rochester Laboratory**  
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623  
Phone (585) 288-5380 Fax (585) 288-8475  
[www.alsglobal.com](http://www.alsglobal.com)

Analytical Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water  
**Sample Name:** Method Blank  
**Lab Code:** R1802087-MB

**Service Request:** R1802087  
**Date Collected:** NA  
**Date Received:** NA  
**Basis:** NA

**Inorganic Parameters**

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>LOQ</u>	<u>LOD</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	ND U	mg/L	0.10	0.08	0.03	1	03/09/18 16:32	

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dba ALS Environmental

## QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Collected:** 03/08/18  
**Date Received:** 03/09/18  
**Date Analyzed:** 03/9/18

**Duplicate Matrix Spike Summary**  
**Iron, Divalent (Ferrous Iron)**

**Sample Name:** 35AWW06\_030818  
**Lab Code:** R1802087-002  
**Analysis Method:** SM 3500-Fe B.4.c

**Units:** mg/L  
**Basis:** NA

Analyte Name	Sample Result	Matrix Spike R1802087-002MS			Duplicate Matrix Spike R1802087-002DMS			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Iron, Divalent (Ferrous Iron)	0.08 J	0.60	0.40	130 *	0.62	0.40	135 *	67-129	3	20

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150  
**Sample Matrix:** Water

**Service Request:** R1802087  
**Date Analyzed:** 03/09/18

**Lab Control Sample Summary**  
**General Chemistry Parameters**

**Units:**mg/L  
**Basis:**NA

**Lab Control Sample**  
R1802087-LCS

<b>Analyte Name</b>	<b>Analytical Method</b>	<b>Result</b>	<b>Spike Amount</b>	<b>% Rec</b>	<b>% Rec Limits</b>
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	0.408	0.40	102	67-129

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QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150

**Service Request:**R1802087

**Continuing Calibration Blank (CCB) Summary**  
**Iron, Divalent (Ferrous Iron)**

**Analysis Method:** SM 3500-Fe B.4.c

**Units:**mg/L

	<b>Analysis Lot</b>	<b>Lab Code</b>	<b>Date Analyzed</b>	<b>LOQ</b>	<b>LOD</b>	<b>MDL</b>	<b>Result</b>	<b>Q</b>
CCB1	584590	RQ1802612-02	03/09/18 16:32	0.10	0.08	0.03	ND	U
CCB2	584590	RQ1802612-05	03/09/18 16:32	0.10	0.08	0.03	ND	U

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dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** LHAAP Site 58 HS18030472/NWO1312.0150

**Service Request:** R1802087

### Continuing Calibration Verification (CCV) Summary

#### Iron, Divalent (Ferrous Iron)

**Analysis Method:** SM 3500-Fe B.4.c

**Units:** mg/L

	Analysis		Date	True	Measured	Percent	Acceptance
	Lot	Lab Code	Analyzed	Value	Value	Recovery	Limits
CCV1	584590	RQ1802612-01	03/09/18 16:32	2.00	2.10	105	90-110
CCV2	584590	RQ1802612-06	03/09/18 16:32	2.00	2.09	105	90-110



10515 Research Drive  
Knoxville, TN 37932  
Phone: (865) 573-8188  
Fax: (865) 573-8133

---

**Client:** RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Rd  
Suite 210  
Houston, TX 77040

**Phone:** 281-575-2279

**Fax:**

**Identifier:** 043PC

**Date Rec:** 03/09/2018

**Report Date:** 03/14/2018

**Client Project #:** NWD1312.0150

**Client Project Name:** LHAAP-58

**Purchase Order #:** HS18030472

**Analysis Requested:** CENSUS

**Reviewed By:**

A handwritten signature in black ink, appearing to read 'Joan Spurr'. The signature is written in a cursive style with a horizontal line underneath.

---

NOTICE: This report is intended only for the addressee shown above and may contain confidential or privileged information. If the recipient of this material is not the intended recipient or if you have received this in error, please notify Microbial Insights, Inc. immediately. The data and other information in this report represent only the sample(s) analyzed and are rendered upon condition that it is not to be reproduced without approval from Microbial Insights, Inc. Thank you for your cooperation.

**MICROBIAL INSIGHTS, INC.**

10515 Research Dr., Knoxville, TN 37932  
 Tel. (865) 573-8188 Fax. (865) 573-8133

**CENSUS**

**Client:** ALS Laboratory Group  
**Project:** LHAAP-58

**MI Project Number:** 043PC  
**Date Received:** 03/09/2018

**Sample Information**

Client Sample ID:	35AWW19_0308	35AWW06_030	35AWW06_030	35AWW23_0308	35AWW24_0308
	18	818	818_a	18	18
Sample Date:	03/08/2018	03/08/2018	03/08/2018	03/08/2018	03/08/2018
Units:	cells/mL	cells/mL	cells/mL	cells/mL	cells/mL
Analyst/Reviewer:	JS	JS	JS	JS	JS

**Dechlorinating Bacteria**

<i>Dehalococcoides</i>	<i>DHC</i>	4.00E-01 (J)	1.40E+00	1.50E+00	<5.00E-01	<2.00E+00
tceA Reductase	TCE	<1.20E+00	1.00E-01 (J)	<5.00E-01	<5.00E-01	<2.00E+00
BAV1 Vinyl Chloride Reductase	BVC	<1.20E+00	<5.00E-01	<5.00E-01	<5.00E-01	<2.00E+00
Vinyl Chloride Reductase	VCR	<1.20E+00	<5.00E-01	<5.00E-01	<5.00E-01	<2.00E+00
<i>Dehalobacter spp.</i>	<i>DHBt</i>	<1.19E+01	2.91E+02	2.18E+02	<4.80E+00	7.99E+01

**Legend:**

NA = Not Analyzed    NS = Not Sampled    J = Estimated gene copies below PQL but above LQL    I = Inhibited  
 < = Result not detected

## Quality Assurance/Quality Control Data

Samples Received 3/9/2018

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	03/09/2018	03/14/2018	0 °C	101%	non-detect	non-detect
BVC	03/09/2018	03/14/2018	0 °C	102%	non-detect	non-detect
DHBt	03/09/2018	03/14/2018	0 °C	106%	non-detect	non-detect
TCE	03/09/2018	03/14/2018	0 °C	101%	non-detect	non-detect
VCR	03/09/2018	03/14/2018	0 °C	103%	non-detect	non-detect

REPORT TO:

Name: MARCIA OLIVE  
 Company: BHATE  
 Address: 445 UNION BLVD. STE. 129  
LAKEWOOD, CO. 80228  
 email: MOLIVE@bhat.com  
 Phone: 205-918-4000  
 Fax: \_\_\_\_\_  
 Project Manager: Kim Nemmers  
 Project Name: LHAAP-58  
 Project No.: NW01312.0150

INVOICE TO: (For Invoices paid by a third party it is imperative that all information be provided)

Name: \_\_\_\_\_  
 Company: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 email: \_\_\_\_\_  
 Phone: \_\_\_\_\_  
 Fax: \_\_\_\_\_  
 Purchase Order No. \_\_\_\_\_  
 Subcontract No. \_\_\_\_\_  
 MI Quote No. \_\_\_\_\_



10515 Research Dr  
 Knoxville, TN 37932  
 865-573-8188  
 www.microbe.com

Please Check One:  
 More samples to follow  
 No Additional Samples

Report Type:  Standard (default)     Microbial Insights Level III raw data(15% surcharge)     Microbial Insights Level IV (25% surcharge)     Comprehensive Interpretive(15%)     Historical Interpretive (30%)  
 EDD type:  Microbial Insights Standard (default)     All other available EDDs (5% surcharge)    Specify EDD Type: \_\_\_\_\_

Please contact us with any questions about the analyses or filling out the COC at (865) 573-8188 (9:00 am to 5:00 pm EST, M-F). After hours email: customerservice@microbe.com

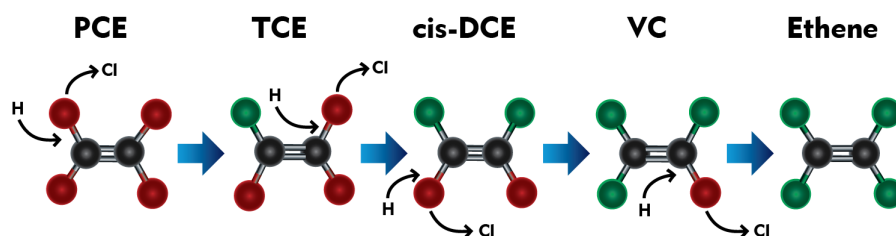
Sample Information				Analyses				CENSUS: Please select the target organism/gene																											
MIID (Laboratory Use Only)	Sample Name	Date Sampled	Time Sampled	Matrix	PLFA	DGGE+3ID	DGGE+5ID	QuantArray Chlor	QuantArray Petro	DHC (Dehalococoides)	DHC Functional genes (bvc, bta, vcr)	DHBT (Dehalobacter)	DSM (Desulfuromonas)	DSB (Desulfibacterium)	EBAC (Total)	SRB	Sulfate Reducing Bacteria-APS)	MGN (Methanogens)	MOB (Methanotrophs)	SMMO	DNF (Denitrifiers-nirS and nirK)	AOB (ammonia oxidizing bacteria)	PM1 (MTBE aerobic)	RMO (Toluene Monooxygenase)	RDEG (Toluene Monooxygenase)	PHE (Phenol Hydroxylase)	NAH (Naphthalene-aerobic)	BSSA (Toluene/Xylene-Anaerobic)	add. qPCR:	add. qPCR:	RNA (Expression Option)*	Other:	Other:	Other:	
043PC 1	35AWW19-030818	3/8/18	0815							✓	✓																								
2	35AWW06-030818	3/8/18	0930							✓	✓																								
3	35AWW06-030818a	3/8/18	0930							✓	✓																								
4	35AWW23-030818	3/8/18	1100							✓	✓																								
5	35AWW24-030818	3/8/18	1210							✓	✓																								
Relinquished by: <u>[Signature]</u>				3/8/18	1430	Received by: <u>[Signature]</u>				Date: <u>3/9/18 930</u>																									

It is vital that chain of custody is filled out correctly & that all relative information is provided.  
 Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable.




## DHC Interpretation

### *Dehalococcoides* 16S rRNA gene (qDHC)

Under anaerobic conditions, tetrachloroethene (PCE) and trichloroethene (TCE) can undergo sequential reductive dechlorination through the daughter products *cis*-dichloroethene (*cis*-DCE) and vinyl chloride to nontoxic ethene (1,2).



While a number of bacterial cultures capable of utilizing PCE and TCE as growth supporting electron acceptors have been isolated (3-7), *Dehalococcoides* spp. may be the most important because they are the only bacterial group that has been isolated to date which is capable of complete reductive dechlorination of PCE to ethene (8). In fact, the presence of *Dehalococcoides* spp. has been associated with complete dechlorination to ethene at sites across North America and Europe (9).

Status	<i>Dehalococcoides</i> spp.	Observation
	$\geq 10^4$ (cells/mL)	Lu et al. proposed that a concentration of $1 \times 10^4$ DHC cells/mL could be used as a screening criterion to identify sites where reductive dechlorination will yield a generally useful biodegradation rate (10).  Similarly, in an internal study conducted with nearly 1000 groundwater samples obtained from sites across the US, ethene production was observed in approximately 80% of samples in which CENSUS® qDHC results were greater than or equal to $10^4$ DHC cells/mL.
	$10^1$ to $< 10^4$ (cells/mL)	When vinyl chloride reductase genes (See DHC functional genes discussion below) are also detected, complete reductive dechlorination of PCE and TCE to ethene may still occur even with moderate DHC concentrations.  When the DHC population is below the $10^4$ cells/mL criterion proposed by Lu et al. (10), project managers should carefully consider other site-specific data to determine whether subsurface conditions may be limiting reductive dechlorination. For example, the addition of an electron donor may be able to stimulate DHC growth and enhance anaerobic bioremediation.
	$< 10^1$ (cells/mL)	DHC concentrations are low suggesting that complete reductive dechlorination of PCE and TCE to ethene is unlikely to occur under existing conditions. Enhanced anaerobic bioremediation options (biostimulation or bioaugmentation) may need to be considered.

### DHC Functional Genes (*tceA*, *bvcA*, *vcrA*)

A “stall” where daughter products *cis*-DCE and vinyl chloride accumulate can occur at PCE- and TCE-impacted sites especially under MNA conditions. The accumulation of vinyl chloride, generally considered more carcinogenic than the parent compounds, is particularly problematic. Although elevated *Dehalococcoides* concentrations correspond to ethene production in numerous studies, the range of chlorinated ethenes metabolized and cometabolized varies among species and strains within the *Dehalococcoides* genus. For example, *Dehalococcoides ethenogenes* str. 195 metabolizes PCE, TCE, and *cis*-DCE and cometabolizes vinyl chloride (8) to produce ethene. Conversely, *Dehalococcoides* sp. CBDB1 utilizes PCE and TCE but does not cometabolize additional chloroethenes (11). Other *Dehalococcoides* strains, such as BAV1, GT and VS, are known to fully dechlorinate *cis*-DCE and VC to ethene (14,16,19). Quantification of reductive dehalogenase genes is used to more definitively confirm the potential for reductive dechlorination of TCE, *cis*-DCE, and vinyl chloride (12-15).

#### Functional Gene

#### Observation

### TCE Reductase

<b><i>tceA</i> gene</b>	<p>The <i>tceA</i> gene encodes the enzyme responsible for reductive dechlorination of TCE to <i>cis</i>-DCE in some strains of <i>Dehalococcoides</i>.</p> <p>Absence of <i>tceA</i> does not preclude the potential for reductive dechlorination of TCE in the field since the <i>tceA</i> gene is not universally distributed among all DHC and is not present in other microorganisms capable of reductive dechlorination of TCE (e.g. <i>Dehalobacter</i>).</p> <p>Detection of the <i>tceA</i> gene provides an additional line of evidence indicating the potential for dechlorination of TCE.</p>
-------------------------	---

### Vinyl Chloride Reductase

<b><i>bvcA</i> gene</b>	<p>The <i>bvcA</i> gene encodes the vinyl chloride reductase enzyme responsible for reductive dechlorination of vinyl chloride to ethene by <i>Dehalococcoides</i> sp. str. BAV1 (16).</p> <p>Presence of <i>bvcA</i> gene indicates the potential for reductive dechlorination of VC to ethene.</p> <p>Absence of both <i>bvcA</i> and <i>vcrA</i> genes suggests VC may accumulate.</p> <p>An internal study with ~1,000 samples showed ethene production was observed in 80% of the samples that the DHC population was greater than or equal to 10<sup>4</sup> cells/mL. The <i>bvcA</i> gene was detected in over 50% of these samples.</p> <p>Van Der Zaan et al (17) noted that the <i>bvcA</i> gene was the only VC reductase gene detected at three of their sites.</p> <p>Alfred Spormann’s laboratory at Stanford University (18) reported that the <i>bvcA</i> gene was the most abundant and active at the outflow of a PCE fed column study. This section of the column was in the DCE to VC stages of reductive dechlorination thus confirming the importance of the <i>bvcA</i> gene for complete reductive dechlorination.</p>
<b><i>vcrA</i> gene</b>	<p>The <i>vcrA</i> gene encodes the vinyl chloride reductase enzyme responsible for reductive dechlorination of <i>cis</i>-DCE and vinyl chloride by <i>Dehalococcoides</i> sp. strain VS (14).</p> <p>Presence of <i>vcrA</i> gene indicates the potential for reductive dechlorination of DCE and/or VC to ethene.</p> <p>Absence of both <i>bvcA</i> and <i>vcrA</i> genes suggest VC may accumulate.</p> <p>As with the <i>bvcA</i> gene, detection of the <i>vcrA</i> gene is associated with ethene production in internal studies (67%) and vinyl chloride reduction in independent studies (14, 17).</p>

## Reporting

Microbial Insights can provide a variety of data packages and reporting levels to suit the needs of any project. Data packages range from simple analytical reports with results only to more complex data packages that include a report narrative, analytical results, QC data, and supporting materials including all raw data and chain-of-custody documentation. The figure below shows our standard report and explains the way values are reported.

### Microbial Insights, Inc.

2340 Stock Creek Blvd. Rockford, TN 37853-3044  
Tel. (865) 573-8188 Fax. (865) 573-8133

**CENSUS**

<b>Client:</b>	Company Name	<b>MI Project Number:</b>	Unique Laboratory Identifier
Project:	Your Project Name	Date Received:	Date Samples Arrived

### Sample Information

Client Sample ID:	Sample A	Sample B	Sample C
Sample Date:	00/00/0000	00/00/0000	00/00/0000
Units:	cells/mL	cells/mL	cells/mL
Analyst:	Intials	Intials	Intials

### Dechlorinating Bacteria

Species	DHC	Sample A	Sample B	Sample C
<i>Dehalococcoides spp.</i>	DHC	1.84E+05	2.76E+02	2.28E+01 (J)

### Functional Genes

Gene	Gene	Sample A	Sample B	Sample C
tceA Reductase	TCE	6.00E+01	3.23E+01	<4.00E-01
bvcA Reductase	BVC	1.17E+04	1.81E+01	<4.00E-01
vcrA Reductase	VCR	8.42E+04	1.74E+02	<4.00E-01

### Legend:

NA = Not Analyzed    NS = Not Sampled    J = Estimated gene copies below PQL but above LQL  
< = Result not detected

#### "J" value

Result is an estimated value. This data qualifier (flag) is used when the target gene is detected but at a concentration or abundance below the practical quantification limit (PQL).

#### < value

The target gene was not detected at the limit of quantitation (LOQ) reported for that sample.

#### I = Inhibited

#### "I" value

QA Procedure indicated that the sample may have exhibited PCR inhibition. Although relatively rare, PCR inhibition can occur due to the presence of metals or humic acids at high concentrations in the sample.

## Quality Assurance

Microbial Insights' comprehensive Quality Assurance (QA) Program is the foundation of all laboratory analyses, ensuring that our clients receive high-quality analytical services that are timely, reliable, and meet their intended purpose in a cost effective manner. MI is committed to providing quality data that surpasses regulatory and industry standards, thus enabling the client to make well-informed decisions. MI maintains strict standard operating procedures and QA/QC measures throughout all of the analyses offered. The following Table details specific QA/QC procedures that are used for CENSUS.

QA/QC	Description
<b>Date of Extraction</b>	DNA and RNA extractions are performed the day the samples are received by MI to minimize the possibility of any changes to the microbial community prior to analysis.
<b>Laboratory Method Blanks</b>	An extraction blank (no sample added) is processed alongside each set of field samples from DNA extraction through CENSUS® analysis to ensure that cross contamination has not occurred. Although MI has never experienced this issue, the detection of the CENSUS® target (e.g. <i>Dehalococcoides</i> ) in an extraction blank is direct evidence of cross contamination with a sample or contamination of a reagent and would invalidate the results. If this were to occur, MI would re-extract the sample. If not possible to re-extract, MI would contact the client immediately and notate it on the laboratory report.
<b>Laboratory Control Samples (LCS)</b>	A laboratory control sample (LCS) or positive control (target DNA) is included with each CENSUS® plate to confirm amplification and as a continuing calibration check.
<b>Negative Controls</b>	A negative control (no DNA) is included with each CENSUS plate to ensure that cross contamination has not occurred during amplification. As with the extraction blank, detection of CENSUS target (e.g. DHC) in a negative control is direct evidence of contamination and would invalidate the results. If this were to occur, MI would rerun the analysis.

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## How to Retrieve and Use Estimated Percentile Ranks from the Microbial Insights Database

### The MI Database

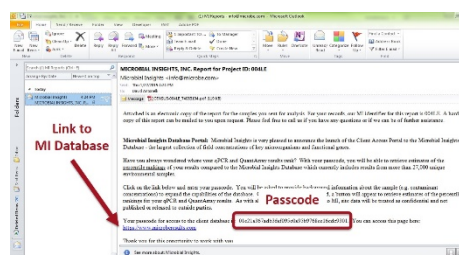
The Microbial Insights Database is the largest collection of field concentrations of key microorganisms and functional genes currently containing qPCR and QuantArray results for more than 40,000 unique groundwater, soil, and sediment samples from all 50 states and 33 countries worldwide.

### Is that low, medium or high?

In practice, biodegradation depends not just on the presence but the actual concentrations of the contaminant degrading microorganisms. The estimated percentile ranks retrieved from the MI Database answer the question “Is that low, medium or high?” by comparing your results to those of the literally thousands of other environmental samples submitted to MI for analysis over the last 20+ years.

### Retrieving Estimated Percentile Ranks

With your report, you were emailed a passcode and link enabling you to login to the Client Portal. Just enter basic information about the sample (e.g. contaminant concentrations) to aid in understanding the links between environmental conditions and microbial populations and you can retrieve estimates of the percentile ranks of your results based on those compiled in the MI database at no additional charge.



Well ID	Sample ID	Sample Date	Analysis Method	Run ID	CAS #	Analyte	Concentration	Units	Notes
MW1	MW1Q4	10/28/2014	SW8260B	1	107-06-2	1,2-Dichloroethane	21	5	UG/L
MW1	MW1Q4	10/28/2014	SW8260B	1	156-59-2	cis-1,2-Dichloroethene	25	5	UG/L
MW1	MW1Q4	10/28/2014	SW8260B	1		trans-1,2-Dichloroethene	5.8	5	UG/L
MW1	MW1Q4	10/28/2014	SW8260B	1	127-1				
MW1	MW1Q4	10/28/2014	SW8260B	1	67-66				
MW1	MW1Q4	10/28/2014	SW8260B	1	79-01				
MW2	MW2Q4	11/6/2014	SW8260B	1	107-07				
MW2	MW2Q4	11/6/2014	SW8260B	1	156-5				
MW2	MW2Q4	11/6/2014	SW8260B	1	123-9				
MW2	MW2Q4	11/6/2014	SW8260B	1	127-1				
MW2	MW2Q4	11/6/2014	SW8260B	2	79-01				
MW2	MW2Q4	11/6/2014	SW8260B	1	67-66				
MW2	MW2Q4	11/6/2014	SW8260B	1	75-01				

Field names in 1<sup>st</sup> row

Save as Text (Tab delimited)

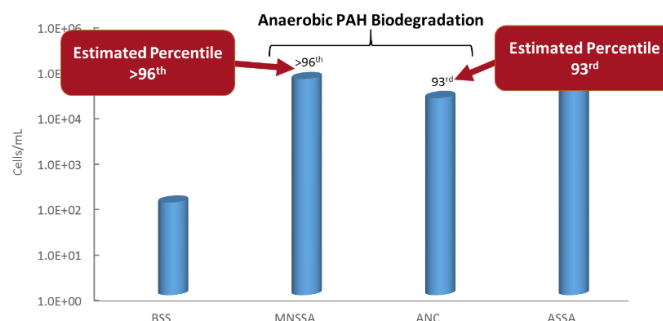
All site specific data will be treated as confidential and uploading is easy.

You can even upload chemical and geochemical data from EDDs. Just save as a Tab Delimited text file.

### Example - Using Estimated Percentile for MNA Assessment at an MGP Site

CENSUS<sup>®</sup> qPCR was performed to quantify anaerobic naphthalene carboxylase (ANC) and naphthyl-2-methylsuccinate synthase (MNSSA) to assess anaerobic biodegradation of naphthalene and methyl-naphthalene under existing site conditions.

- Not only were ANC and MNSSA genes detected, but these functional genes responsible for anaerobic biodegradation of PAHs were present at concentrations “far better than average” based on the estimated percentile ranks.
- Demonstrating high concentrations of ANC and MNSSA gave an additional line of evidence indicating growth substantial populations of anaerobic PAH degraders and suggested a greater probability that monitored natural attenuation (MNA) will be successful.



**APPENDIX E**  
**FIELD LOGS FOR WATER QUALITY EVALUATION**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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GROUNDWATER SAMPLE COLLECTION FORM

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: <u>35A WW 11</u>	Date: <u>4/4/18</u>
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Kennie Moore
<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
<b>WELL INFO</b>	Casing Type / ID (in): <u>2"</u>	Unit Casing Volume (gal/lin ft) (A): <u>0.160</u>	Initial Depth to Water (ft) (B): <u>29.91</u>
	Total Well Depth (ft) (C): <u>38.06</u>	Water Column Thickness (ft) (C-B): <u>8.15</u>	Well Volume (gal) (A*(C-B)): <del>30.16</del> <u>1.30</u>
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: <u>Clear / cool</u>	Well Condition: <u>Good</u>	Comments:

<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
<u>4/4/18</u>	<u>1050</u>	<u>29.97</u>	<u>.13</u>	<u>100</u>	<u>16.89</u>	<u>5.14</u>	<u>8.66</u>	<u>0.68</u>	<u>414</u>	<u>-256</u>	
	<u>1055</u>	<u>30.05</u>	<u>.26</u>	<u>100</u>	<u>17.20</u>	<u>4.99</u>	<u>8.65</u>	<u>0.00</u>	<u>347</u>	<u>-275</u>	
	<u>1000</u>	<u>30.10</u>	<u>.39</u>	<u>100</u>	<u>17.37</u>	<u>4.92</u>	<u>8.65</u>	<u>0.00</u>	<u>251</u>	<u>-293</u>	
	<u>1105</u>	<u>30.12</u>	<u>.52</u>	<u>100</u>	<u>17.38</u>	<u>4.89</u>	<u>8.65</u>	<u>0.00</u>	<u>191</u>	<u>-318</u>	
	<u>1110</u>	<u>30.14</u>	<u>.65</u>	<u>100</u>	<u>17.44</u>	<u>4.86</u>	<u>8.64</u>	<u>0.00</u>	<u>143</u>	<u>-321</u>	
	<u>1115</u>	<u>30.16</u>	<u>.78</u>	<u>100</u>	<u>17.37</u>	<u>4.87</u>	<u>8.64</u>	<u>0.00</u>	<u>132</u>	<u>-323</u>	
	<u>1120</u>	<u>30.19</u>	<u>.91</u>	<u>100</u>	<u>17.19</u>	<u>4.88</u>	<u>8.63</u>	<u>0.00</u>	<u>118</u>	<u>-325</u>	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units							

Conversions	Stabilization Criteria				Sample ID:	Sample Time:
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		
	Cond	+/- 10%	ORP	+/- 10		



## GROUNDWATER SAMPLE COLLECTION FORM

Page 1 of 1

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: <u>35 A MW 20</u>	Date: <u>4/4/18</u>								
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Kennie Moore								
<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA								
	Water Level Indicator Type/ID#: Solinst 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water								
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D								
<b>WELL INFO</b>	Casing Type / ID (in): <u>2"</u>	Unit Casing Volume (gal/lin ft) (A): <u>0.160</u>	Initial Depth to Water (ft) (B): <u>19.53</u>								
	Total Well Depth (ft) (C): <u>36.20</u>	Water Column Thickness (ft) (C-B): <u>16.67</u>	Well Volume (gal) (A*(C-B)): <u>2.66</u>								
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA								
	Weather: <u>Clear/cool</u>	Well Condition: <u>Good</u>	Comments:								
<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57
<b>DATE</b>	<b>TIME (24 Hr)</b>	<b>Water Level (BTOC)</b>	<b>Volume Removed (Gals)</b>	<b>Pumping Rate (ml/min)</b>	<b>Temp (C)</b>	<b>pH</b>	<b>Cond (mS/cm)</b>	<b>DO (mg/l)</b>	<b>Turb (NTU)</b>	<b>ORP (mV)</b>	<b>Remarks (odor, clarity, etc.)</b>
<u>4/4/18</u>	<u>0955</u>	<u>19.60</u>	<u>.13</u>	<u>100</u>	<u>19.86</u>	<u>5.75</u>	<u>8.83</u>	<u>0.00</u>	<u>150</u>	<u>-282</u>	
	<u>1000</u>	<u>19.65</u>	<u>.26</u>	<u>100</u>	<u>20.46</u>	<u>5.67</u>	<u>8.85</u>	<u>0.00</u>	<u>130</u>	<u>-284</u>	
	<u>1005</u>	<u>19.70</u>	<u>.39</u>	<u>100</u>	<u>20.88</u>	<u>5.63</u>	<u>8.86</u>	<u>0.00</u>	<u>103</u>	<u>-288</u>	
	<u>1010</u>	<u>19.72</u>	<u>.52</u>	<u>100</u>	<u>20.91</u>	<u>5.62</u>	<u>8.91</u>	<u>0.00</u>	<u>74.1</u>	<u>-289</u>	
	<u>1015</u>	<u>19.73</u>	<u>.65</u>	<u>100</u>	<u>20.77</u>	<u>5.61</u>	<u>8.93</u>	<u>0.00</u>	<u>66.8</u>	<u>-294</u>	
	<u>1020</u>	<u>19.75</u>	<u>.78</u>	<u>100</u>	<u>20.77</u>	<u>5.61</u>	<u>8.93</u>	<u>0.00</u>	<u>60.7</u>	<u>-294</u>	
<b>Colorimeter Results</b>				<b>No. Containers/Volume/Type</b>				<b>Preserv.</b>	<b>Filter (Y/N)</b>	<b>Method</b>	<b>Parameter(s)</b>
<b>Time</b>	<b>Analyte</b>	<b>Dilution</b>	<b>Result</b>	<b>Units</b>							
<b>Conversions</b>	<b>Stabilization Criteria</b>										
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%							
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%							
	Cond	+/- 10%	ORP	+/- 10	Sample ID:					Sample Time:	



## GROUNDWATER SAMPLE COLLECTION FORM

Page 1 of 1

<b>LOCATION</b>	Site: LHAAP - 58	Location ID: <u>LHS MW07</u>	Date: <u>4/4/18</u>								
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Kennie Moore								
<b>EQUIPMENT</b>	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA								
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water								
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D								
<b>WELL INFO</b>	Casing Type / ID (in): <u>4"</u>	Unit Casing Volume (gal/lin ft) (A): <u>0.652</u>	Initial Depth to Water (ft) (B): <u>18.51</u>								
	Total Well Depth (ft) (C): <u>30.46</u>	Water Column Thickness (ft) (C-B): <u>11.95</u>	Well Volume (gal) (A*(C-B)): <u>7.79</u>								
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA								
	Weather: <u>Clear/cool</u>	Well Condition: <u>Good</u>	Comments: <u>NA</u>								
<b>CASING INFO</b>	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57
<b>DATE</b>	<b>TIME (24 Hr)</b>	<b>Water Level (BTOC)</b>	<b>Volume Removed (Gals)</b>	<b>Pumping Rate (ml/min)</b>	<b>Temp (C)</b>	<b>pH</b>	<b>Cond (mS/cm)</b>	<b>DO (mg/l)</b>	<b>Turb (NTU)</b>	<b>ORP (mV)</b>	<b>Remarks (odor, clarity, etc.)</b>
<u>4/4/18</u>	<u>0855</u>	<u>18.59</u>	<u>0.13</u>	<u>100</u>	<u>13.74</u>	<u>7.41</u>	<u>10.7</u>	<u>1.60</u>	<u>366</u>	<u>-138</u>	
	<u>0900</u>	<u>18.65</u>	<u>0.26</u>	<u>100</u>	<u>16.23</u>	<u>5.12</u>	<u>10.5</u>	<u>1.43</u>	<u>440</u>	<u>-395</u>	
	<u>0905</u>	<u>18.69</u>	<u>0.39</u>	<u>100</u>	<u>16.42</u>	<u>5.07</u>	<u>10.5</u>	<u>0.24</u>	<u>375</u>	<u>-410</u>	
	<u>0910</u>	<u>18.71</u>	<u>0.52</u>	<u>100</u>	<u>16.49</u>	<u>5.07</u>	<u>10.5</u>	<u>0.02</u>	<u>361</u>	<u>-411</u>	
	<u>0915</u>	<u>18.73</u>	<u>0.65</u>	<u>100</u>	<u>16.72</u>	<u>5.05</u>	<u>10.5</u>	<u>0.01</u>	<u>354</u>	<u>-413</u>	
	<u>0920</u>	<u>18.76</u>	<u>0.78</u>	<u>100</u>	<u>16.96</u>	<u>5.03</u>	<u>10.5</u>	<u>0.00</u>	<u>352</u>	<u>-414</u>	
	<u>0925</u>	<u>18.78</u>	<u>0.91</u>	<u>100</u>	<u>17.14</u>	<u>5.02</u>	<u>10.5</u>	<u>0.00</u>	<u>350</u>	<u>-412</u>	
<b>Colorimeter Results</b>				<b>No. Containers/Volume/Type</b>				<b>Preserv.</b>	<b>Filter (Y/N)</b>	<b>Method</b>	<b>Parameter(s)</b>
<b>Time</b>	<b>Analyte</b>	<b>Dilution</b>	<b>Result</b>	<b>Units</b>							
<b>Conversions</b>	<b>Stabilization Criteria</b>										
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%							
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%							
	Cond	+/- 10%	ORP	+/- 10	Sample ID:				Sample Time:		

**APPENDIX F**  
**QUALITY CONTROL SUMMARY REPORT**

RACR - WESTERN PLUME  
LHAAP-35A (58) SHOPS AREA

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**QUALITY CONTROL SUMMARY REPORT  
LHAAP-58 MARCH 2018  
BASELINE SAMPLING EVENT  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS**

**August 2018**

*Prepared For:*



**Longhorn Army Ammunition Plant  
Karnack, Texas**

*Under Contract To:*



**U.S. Army Corps of Engineers  
Tulsa District  
Tulsa, Oklahoma**

**Contract Number: W9128F-13-D-0012**

**Task Order Number: W912BV17F0150**

*Prepared By:*



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Birmingham, Alabama 35205  
1-800-806-4001 • [www.bhate.com](http://www.bhate.com)**

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Table 3: Completeness by Method

## 1 INTRODUCTION

Bhate reviewed two data packages from ALS Environmental, Houston, Texas with the analyses for ferrous iron and volatile fatty acids subcontracted to ALS Rochester, NY, and the analyses of dissolved gases to ALS Simi Valley, CA. The dechlorinating bacteria analysis was subcontracted to Microbial Insights in Knoxville, TN. Groundwater samples were collected March 7-8, 2018, from Site LHAAP-58 at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. Data were reviewed for conformance to the requirements of the following guidance documents: [United States Environmental Protection Agency] *USEPA Contract Laboratory Program [CLP] National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA, January 2017); *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (USEPA, January 2017); and the *Army Draft Basewide Uniform Federal Policy (UFP) – Quality Assurance Project Plan (QAPP) Longhorn Army Ammunition Plant* (Bhate, November 2017).

### 1.1 Intended Use of Data

The objective of sampling at LHAAP-58 in March 2018 was to establish the baseline event.

Analyses performed include:

- SM2320B– Alkalinity
- E365.3 – Phosphorus
- RSK175 – Dissolved Gases
- E415.1– Total Organic Carbon
- SW8260C – Volatiles Organic Compounds (VOCs)
- SM3500Fe- Ferrous Iron
- SW6020A – Total and Dissolved Metals (Iron and Manganese)
- SW9056A – Anions
- E376.1 – Sulfide
- HPLC-METACIDS – Volatile Fatty Acids (VFAs)
- CENSUS – Dechlorinating Bacteria (Dehalococcoides [DHC]/Dehalobacter [DHB])

**Table 1** lists the sample identification (ID) numbers and their associated laboratory package.

**Table 2** lists qualified results with the qualification flag and reason code.

The following narrative is a brief synopsis of data that required qualification due to quality control discrepancies.

### 1.2 Preservation and Holding Times

Sample IDs were evaluated for agreement with the chain-of-custody (COC). All samples were received in appropriate containers, within the proper temperature range, in good condition, and within the required hold time with the following exception.

- The analysis for ferrous iron was outside the requisite 24 hours hold time and all results were qualified as estimated, "J".

### 1.3 Calibrations

All analytes reported must be present in the initial and continuing calibration. The calibrations must meet the acceptance criteria specified in Worksheet 24 (Analytical Instrument Calibration) of the QAPP. All results reported must be within the calibration range.

Samples were diluted, if necessary, to bring analyte responses within the calibration range.

#### 1.3.1 Continuing Calibration Verifications

The calibrations must meet the following criteria otherwise the compound is qualified J or UJ: The continuing calibration verification (CCV) criteria are 20 percent difference (%D) for VOCs and 50% for closing CCVs. Metals and general chemistry are 10 %D; and VFAs, dissolved gases, and TOC are 15 %D.

The CCV for propionic acid was above control limits in both laboratory packages. This compound was qualified as estimated non-detect, "UJ", in all samples.

### 1.4 Blanks

If the analyte result for an associated sample was less than 5 times (10 times for common laboratory contaminants) the analyte concentration in the blank, that result was qualified "UB" and considered an artifact of blank contamination. Where the sample result for the affected analyte was non-detect or greater than 5 times the amount in the blank, no qualifier was applied.

No compounds were qualified due to blank contamination.

### 1.5 Surrogates

Surrogates were evaluated using limits defined by each method in the project-specific QAPP Worksheet 28.

No surrogates were reported outside control limits.

### 1.6 Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD)

LCS/LCSD recoveries were evaluated using limits defined in the project-specific QAPP Worksheet 15.

All sample recoveries were within control limits.

### 1.7 Matrix Spike (MS)/Matrix Spike Duplicate Sample (MSD)

MS/MSD recoveries were evaluated using limits defined in Worksheet 15 of the project-specific QAPP. When sample results were greater than 4 times the spike amount, control limits were not applicable and require no qualification. Furthermore, if a MS/MSD analyses was performed on a batched (unrelated) sample no qualification was made to the sample data.

### 1.7.1 SW8260C

The MS and/or MSD recoveries for 1,2-dichlorobenzene (76.5%/76.9%); 1,3-dichlorobenzene (76.9%/78.5%); 1,4-dichlorobenzene (74.6%/75.8%); 1,3-dichloropropane ( /78.7%), bromobenzene (75.7%/76.4%); methylene chloride ( /73.9%); and toluene ( /79.8%) were below control limits. These compounds were qualified as estimated non-detected, "UJ", in the spike sample 35AWW19\_030818.

### 1.7.2 SW6020A

The MSD recovery (76.1%) for total manganese in spike sample 35AWW06\_030818 was below control limits and was qualified as estimated, "J".

### 1.7.3 SM3500Fe

The MS and MSD recoveries (130%/135%) for ferrous iron were above control limits and ferrous iron was qualified as estimated, "J", in the spike sample 35AWW06\_030818.

## 1.8 Internal Standards

If the percent recovery (%R) for an internal standard in a sample is not within the limit, the associated sample is qualified for those analytes associated with the internal standard(s) outside of the limit.

Internal standards were within acceptance criteria for the associated compounds.

## 1.9 Field Precision

Precision is the measure of variability of individual sample measurements. Evaluation of field duplicates for precision was done using the relative percent difference (RPD). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. Field duplicate RPD limits were set at <30% for groundwater matrices.

### 1.9.1 RSK-175

The RPD, between 35AWW06\_030818 and its duplicate, was exceeded for carbon dioxide (46.9%). This compound was qualified as estimated, "J", in both sample and duplicate.

### 1.9.2 SM3500Fe

The RPD for ferrous iron was 40% and exceeded the project defined control limits. This analyte was qualified as estimated, "J", in the sample (35AWW06\_030818) and duplicate.

## 2 DATA USABILITY SUMMARY

The data are usable for the intended purposes of the project (see Table 3). The data quality objectives have been met for the project.

**Table 1: Field Sample Identification and Laboratory Packages**

Client Sample ID	Lab Package-ID	SM2320B	E365.3	E415.1	SW6020A	SW8260C	HPLC-METACIDS	SW9056A	RSK-175	SM3500Fe	E376.1	CENSUS
35AWW06_030818	HS18030472-02	X	X	X	X	X	X	X	X	X	X	X
35AWW06_030818_a	HS18030472-03	X	X	X	X	X	X	X	X	X	X	X
35AWW11-030718	HS18030365-03	X	X	X	X	X	X	X	X	X	X	X
35AWW19_030818	HS18030472-01	X	X	X	X	X	X	X	X	X	X	X
35AWW20-030718	HS18030365-01	X	X	X	X	X	X	X	X		X	X
35AWW23_030818	HS18030472-04	X	X	X	X	X	X	X	X	X	X	X
35AWW24_030818	HS18030472-05	X	X	X	X	X	X	X	X	X	X	X
LHSMW07-030718	HS18030365-02	X	X	X	X	X	X	X	X	X	X	X

Notes: MW - Monitoring Well, SM - Standard Method, SW - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, E - U.S. Environmental Protection Agency Method, HS - Houston, HPLC - High Performance Liquid Chromatography

**Table 2: Qualified Data**

Client Sample ID Laboratory	Laboratory Package-ID	Analyte Name	Data Validation Qualifier	Reason for Qualification
35AWW19_030818	HS18030472-01	Ferrous iron Propionic acid 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,3-Dichloropropane Bromobenzene Methylene chloride Toluene	1.1 J 1.0 UJ 0.5 UJ 0.5 UJ 0.5 UJ 0.5 UJ 0.5 UJ 1.0 UJ 0.5 UJ	HT CCV MS/MSD < MS/MSD < MS/MSD < MSD < MS/MSD < MSD < MSD <
35AWW06_030818	HS18030472-02	Ferrous iron Propionic acid Carbon dioxide Total manganese	0.08 J 1.0 UJ 500,000 J 0.236 J	HT/Dup RPD/MS/MSD > CCV Dup RPD MSD <
35AWW06_030818_a	HS18030472-03	Ferrous iron Propionic acid Carbon dioxide	0.12 J 1.0 UJ 310,000 J	HT/Dup RPD CCV Dup RPD
35AWW23_030818	HS18030472-04	Ferrous iron Propionic acid	0.13 J 1.0 UJ	HT CCV
35AWW24_030818	HS18030472-05	Ferrous iron Propionic acid	0.33 J 1.0 UJ	HT CCV
35AWW20-030718	HS18030365-01	Ferrous iron Propionic acid	0.69 J 1.0 UJ	HT CCV
LHSMW07-030718	HS18030365-02	Ferrous iron Propionic Acid	0.07 J 1.0 UJ	HT CCV
35AWW11-030718	HS18030365-03	Ferrous iron Propionic acid	0.1 J 1.0 UJ	HT CCV

Notes: J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.  
 UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.  
 MS/MSD >/<- Matrix spike/duplicate recoveries above/below control limits,  
 Dup RPD - the relative percent difference between sample and duplicate was outside control limits  
 HT - exceeded recommended hold time, CCV - continuing calibration verification outside control limits

**Table 3: Completeness by Method**

Method	No. of Rejected Results	% Completeness
SM2320B	0	100
E365.3	0	100
E415.1	0	100
SW6020A	0	100
SW8260C	0	100
HPLC-METACIDS	0	100
SW9056A	0	100
RSK-175	0	100
SM3500Fe	0	100
E376.1	0	100
CENSUS	0	100