Subject:	**Final Minutes, Monthly Managers' Meeting (MMM), Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Teleconference**
Date of Meeting:	**20 November 2019– 1:00 Central Standard Time (CST)**

Attendees:

Army BRAC:	Rose M. Zeiler (RMZ)
USEPA:	Rich Mayer (RM), Dorelle Harrison and Bill Rhotenberry (BR)
AEC:	Amanda Sherman (AS)
TCEQ:	April Palmie (AP)
USACE:	Aaron Williams (AW)
Bhate:	Kim Nemmers (KN)
APTIM:	Bill Foss (BF) and Praveen Srivastav (PS)

Action Items

Bhate/APTIM: KN stated that providing ability on the website for people to subscribe for email notices was discussed during the October 2019 MMM. KN stated that APTIM had determined that collection of information was possible, but that AEC was looking at it further. AS stated that the concern was collecting personally identifiable information (PII), which must be Army approved. RM asked for more details on what is considered PII. AS stated that the concern is using "mailchimp," which requires the collection of birth month and year which is PII. AS also said that first and last names are PIIs so AEC is looking at other options that only collects email addresses. KN stated that this item will remain open to keep the discussion going until resolved.

Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update

RM asked about the SmartMap because he needs a new username or password. BF stated that he still needs to follow-up.

BR introduced himself as the Remedial Project Manager that is going to replace RM.

KN stated that the air stripper blower was brought online on Monday, November 19, 2019 and the **groundwater treatment plant (GWTP)** operated without any issues on Tuesday, November 20, 2019. KN stated that the blower was last replaced about 5 years prior and will likely need to be repaired in 5 years again due to rusting and damage from moisture and the acid vapors. KN stated that the analytical data provided for the MMM included data from before the ion exchange vessel and after the first ion exchange vessel to evaluate the effectiveness of the removal of volatile organic compounds (VOCs) by the resin. KN stated that the removal varied by VOC, but was lower than expected with much of the VOCs treated prior to reaching the vessels. KN stated that the groundwater was discharged to the bayou while the air stripper blower was down, with the exception of the first week. KN stated that even though VOCs, methylene chloride in particular, exceed the maximum containment level (MCL), they are below the discharge criteria for the bayou. RMZ clarified that there was one release to the INF pond and that VOCs were not detected or detected at low levels below the MCLs for that discharge, which KN confirmed.

PS stated that previous email correspondence with the Army and Regulators had discussed that water within the excavations at **LHAAP-03 and LHAAP-17** would be sampled and could be discharged to the ground if detected concentrations in the water were below the applicable GW-IND MSC or site specific cleanup value.. PS explained that another two feet of the southwest wall at Area C at

LHAAP-03 needed to be excavated. So, the water sample from Area C was sampled at LHAAP-03. PS discussed the results for the excavation water sampling for LHAAP-03, which had lead detected slightly above the cleanup goal of 15 micrograms per liter. PS stated that there is a lot of water in the excavation and more rain forecasted, so there is no plan to pump the water currently. PS stated that once the rainfall subsides, then water from Area C may be pumped and trucked over to the GWTP for processing. However, with the ongoing rainfall it doesn't make sense to pump now. AP asked if the area discussed was Area C to which PS confirmed. AP asked whether only the areas where we are not at clean up goals for the soil was where water was sampled to which PS confirmed.

PS stated that **LHAAP-17** Areas L, M, N, H, J and K were sampled based upon confirmation samples in those areas exceeding the cleanup value. PS stated that the water samples had explosives and perchlorate. PS stated that the plan is the same for this site as LHAAP-03 for now. RM stated that he was surprised by the explosives. AP stated that she was also. AP asked if the holes were dry prior to the rainfall. BF stated that the excavations touched into the groundwater so there may have been a few areas with some groundwater in the excavation but it was dry otherwise. AP said that the perchlorate was higher than expected since the soil wasn't being removed for perchlorate. RMZ agreed that the levels were high, but two of the excavations are within the hot area of the perchlorate plume. BF said that two of the deeper areas are within or right up against the plume area. AP clarified her understanding that digging stopped the LHAAP-17 units where munitions were encountered and then the water filled into the excavation holes. AP then stated that when the water is pumped out and the soil is backfilled then the soil is not likely to be clean. RMZ stated that the Army understands and that the containments make sense. RMZ asked BF if this is where the Planteco study was done to which BF concurred that Area H is where the study was done. BF said that old piping from the study was pulled up in that area. RMZ said that the pilot study was not renewed because, while the methodology made sense, there was no proof that the perchlorate in the soil wasn't being driven deeper. AP stated that the pilot study pre-dated her. RMZ explained that manure was applied to the soil in the pilot study area and then irrigated and perchlorate was lower following the treatment. RM said the question was whether the perchlorate was being treated or if the contaminant was being driven deeper down. RMZ said she believes that it was treating the perchlorate but was uncertain that some of the perchlorate wasn't being driven down deeper. RM stated that the area did smell like manure when he was out here in a few areas. RMZ indicated that final backfill of the impacted areas will be completed under a different contract. RMZ clarified final backfill will be done under this contract in areas with clean confirmation samples.

PS explained that a round of groundwater samples was supposed to be collected before injections at **LHAAP-04**. However, the baseline sampling event was missed in error so, of the fourteen (14) monitoring wells planned for sampling, eleven (11) wells were sampled when the issue was discovered a few days into the injections. PS explained that the other three (3) wells have emulsified vegetable oil (EVO) present in the wells, which is why those wells were not sampled. PS noted that samples were also collected in January 2019 so that data can also be used for the baseline. AP asked if the data from both events will be used in the RACR to which PS concurred. PS stated that total organic carbon (TOC) groundwater samples were collected one week after the injections at LHAAP-04 also. PS stated that the first quarterly samples will be collected in February 2020.

Regarding **LHAAP-16** mid plume injections, PS stated that after the emails last week, the extraction wells had been pumped for four weeks and that the reason for not seeing bromide was not known. PS stated that Army and Regulatory concurrence was received to shut down the recirculation system. EW-05 through EW-08 were then able to be injected. PS explained that the well head set-up with a polyvinyl chloride (PVC) coupling was put on injections wells 16IW25 through 16IW30 which are constructed of PVC. The seal was good with PVC on PVC connection and the wells were able to receive EVO under pressure. However, when the same set-up was used on 16EW05 through 16EW08, the connections between the PVC head and the 6-inch stainless steel well was not good and so it did not hold under pressure. Gravity feed was initially used, but APTIM has been looking for alternatives because the rate for gravity flow was low. PS stated that stainless steel coupling that can be tightened are being obtained to allow injection under pressure. RM asked why the PVC is having less issues than the steel. PS stated that the contact between PVC and stainless steel is not holding up. BF explained that the fittings is just not as tight due to a slightly different outside diameter of the wells. PS stated that APTIM is setting up at Biobarrier 2. PS stated that performance data being collected for Biobarriers 1 and 3. RM asked if there is any significant difference in the data. PS stated that some of the performance wells are showing good distribution based upon TOC increases observed. PS stated that the data will be shared at MMMs as it becomes available. RM asked if the trichloroethene (TCE) went up on the other side of the bayou. PS stated that only one round water groundwater data for the two new wells (57 and 58) is available. PS pointed out that there was a field duplicate result for one of the wells which may look like an increase but in fact the data is from the same date. PS stated that remedial action operation RA-O sampling is completed for LHAAP-67 and -50 and that LHAAP-37 is being sampled now.

KN asked everyone to refer to the Document and Issues Tracking Table dated November 20, 2019.

- **Task 1** (Project Management) - KN stated that the October 2019 MMM minutes were now considered final. KN stated that AP had indicated the revised 2019 Restoration Advisory Board (RAB) minutes were acceptable but asked if RM had comment. RM confirmed he did not. KN stated that she would issue the minutes to the RAB board.
- **Task 3** (LHAAP-03) **–** PS stated that no documents were in progress but that soil excavation was underway as previously discussed.
- **Task 4** (LHAAP-04) **–** PS stated that there are no documents in progress but that in-situ bioremediation injections has been completed as of the 6th of November 2019.
- **Task 5** (LHAAP-12) **–** PS stated no documents in progress with the next RA(O) sampling event to be completed in December 2019.
- **Task 6** (LHAAP-16) **–** PS stated that no documents are in progress. On-going field work is presented above.
- **Task 7** (LHAAP-17) **–** PS stated that the field work was completed on September 29, 2019 with the stop work order from the Army. PS stated that backfilling is on hold due to water in the excavations. AP asked how long we expect to leave the excavation holes open given we are in the wet season. RM mentioned that the roads are also an issue. PS agreed and reminded everyone that a temporary road was built, which will likely need more gravel and dirt. PS stated that sufficient backfill is now available that meets analytical requirements of clean soil. AP stated that overflow is a concern with the site being near the bayou. RM said that he heard the one pit was overflowing. RMZ wondered if the pits were overflowing one to the other. BF said that he understood it was from one to another due to the temporary road, which is causing water from the ditch to go over the road. BF said that a diversion or berm could be installed at the site without being invasive. AP asked if we can pump some of the areas to open free board. BF said that the concern is that GWTP will not treat the explosives. AP said that she would be surprised if explosives were not considered in the original design of plant.

  RMZ said that there are multiple issues including:

  - Divert and mitigate the water going to the creek,
  - How to treat via GWTP,

- Acceptable levels to discharge to the bayou (TCEQ),
- Possible to have free board in the excavations, and
- Where the contaminated water is versus the known groundwater plume.

BF said there are a lot of things that are feasible, but there are things to address. BF stated the solids suspended in the water is a concern for the GWTP. BF also said that the sheer volume of water is another issue as it is at least 100,000 gallons of water. PS stated that dirt could be used to create some berms if a dozer could be brought into the site. PS said that the west side is where the perchlorate is present (Area H, J and K), but that the east side (Area L, M and N) is where explosives are higher in groundwater. PS stated that the west side is where the plume is located. PS stated that area H is one of the highest areas of perchlorate in groundwater. PS said that explosives are not contaminants of concern for the groundwater. AP asked for the figure to be resent with the plume sketched in along with the wells. PS stated that wells 17WW02 and 17WW06 are for sure in the extraction system. PS stated that additional signage will be added and blocking of access to the site. AP asked about putting a chain up. RMZ said that this is the one site with chain and a sign due to exceedances of industrial exposure. BF said that the chain will need to be moved further down the road due to how the entrance was extended for trucks and a barrier will be needed on the back side of the site as well.

- **Task 9** (LHAAP-37) **–** PS stated that the Year 3 sampling is being started this week and will be shared in the January 2020 meeting. PS stated that the Year 2 Annual RA(O) Report is being prepared.
- **Task 10** (LHAAP-46) **–** PS stated that the validated data from groundwater sampling completed in August 2019 was provided with the October 2019 data package. PS stated that Year 5 Annual RA-O data report is in progress.
- **Task 11** (LHAAP-50) **–**PS stated that the Year 5 RA-O Report is being prepared and should be delivered to the Regulators in January 2020 following Army Review. PS stated that the annual RA(O) sampling was completed in November 2019 with the validated data to be provided at the January 2020 MMM. PS said that the ESD is being put into the AR. Remedial Action Work Plan (RAWP) was issued to the Regulators on 31 October 2019.
- **Task 12** (LHAAP-58) **–** KN stated that the Year 5 RA(O) Report was issued to the Regulators for review on October 30, 2019. KN stated that the recommendations for sampling changes were planned to be implemented in the December 2019 sampling event but that comments on the sampling changes would be addressed ahead of the sample collection. KN stated that the sampling results will likely be presented at the February 2020 MMM.
- **Task 13** (LHAAP-67) **–** PS stated that the draft Year 5 RA(O) Report is in internal review. PS indicated that the site was sampled the last week in October, and that data would be provided for the December 2019 MMM.
- **Task 14** (LHAAP-001-R and –003-R) - KN stated that the Annual Long Term Monitoring Report was final.
- **Task 16** (GWTP) **–** KN indicated that the 2nd Quarter 2019 GWTP issued to the Regulators on November 4, 2019, and that the 3rd Quarter 2019 GWTP Report was being prepared.
- **Task 17** (LHAAP-18/24) **–** KN stated that LHAAP-18/24 will be sampled in December 2019 and that the validated data will be provided at the February 2020 MMM.
- **Task 18** (Surface Water) **–** KN stated that the most recent surface water results are included in the November 2019 MMM data and that no issues were noted.

- **Task 19** (LUC Management Plan) – KN stated that the LUC Management Plan Update was issued final to everyone.
- **Administrative Record –** PS stated that the next AR update is being prepared with a cutoff of June 30, 2019.

Update on other DERP Sites:

- **LHAAP 18/24 –** AW stated that the Proposed Plan was placed into the AR. AW stated that the Record of Decision (ROD) comments would be addressed by November 29, 2019. AP asked about comments being due 30 days later when the holidays fall. RMZ said that legal is currently reviewing and that the Army is trying to have comment responses out by Tuesday, November 26, 2019. AW recognized that this might not gain review time for the Regulators.
  Regarding TCEQ comments about including plumes maps with analytical results, RMZ said that the ROD contains simplified plume shapes in general. RMZ said that although she agrees that it is important to present data that gives the reader an idea of the magnitude of the contamination, she disagrees with AP that data from recent GWTP reports should be presented. Instead the FS plumes maps and potentiometric maps with June 2016 data will be included, which is another ten (10) figures. RMZ thinks this will give the reader the full picture of how contaminated the area is. AP said that no significant changes to the data has occurred to which RMZ concurred. RMZ said that this is the most comprehensive and consistent approach to addressing AP's comments. RMZ also said that legal is reviewing the post-closure Applicable or Relevant and Appropriate Requirement for the UEP soil cover. RMZ said that the land use controls for the landfill caps will terminate when the underlying soil meets the cleanup criteria, not until UUUE. The UEP is within the residential use restriction area anyway which runs until UUUE. AW suggested a call if any issues are identified. RMZ said that EPA's comment about using specific target levels for EISB and other active treatment areas before MNA is implemented resulted in some text changes. However, Army believes that the Remedial Design (RD) is the best places for the target levels to be developed since more information will be known by the time the RD is done. RMZ said that monitored natural attenuation (MNA) target is a difficult one to set this early and that there is still a contingency remedy for the MNA in place also. AP said that the advantage of having this in the ROD is that the ROD will be used to bid the remedy, which RMZ said that this is her reason for not putting this in the ROD.
- **LHAAP-29 –** AW stated that the PP and ROD are being included in the AR.
- **LHAAP-47 –** AW stated that the 1st Post-Screening Investigation (PSI) Addendum is in the AR and the 2nd Addendum to the PSI Report is being included in the next AR update. AW stated that for the 3rd Addendum to the PSI Report, the field work was completed on November 8, 2019 with analytical data available in early December such that the December 31, 2019 due date for the draft investigation report likely needs to be moved out. RMZ said that she would prepare a letter with the new schedule for this secondary document.
- **Five Year Review (FYR) –** AW stated that the FYR was ready to post to the AR.
- PS stated that the RAB minutes, calendar and primary documents for each site have been updated and linked on the website. RM asked if the SmartMap is updated. BF stated that the SmartMap pulls data from APTIM's database in real-time.

Schedule Next Managers' Meeting

The next MMM will be held on Wednesday, December 18, 2019, at 1:00 pm CST via conference call.

Meeting concluded at 2:22 pm CST.

ACRONYM LIST

AEC	Army Environmental Command
AP	April Palmie
APTIM	APTIM Federal Services, LLC
AR	Administrative Record
AS	Amanda Sherman
AW	Aaron Williams
BF	Bill Foss
Bhate	Bhate Environmental Associates, Inc.
BRAC	Base Realignment and Closure
CST	Central Standard Time
DERP	Defense Environmental Restoration Program
EVO	Emulsified vegetable oil
FYR	Five Year Review
GWTP	Groundwater Treatment Plant
KN	Kim Nemmers
LHAAP	Longhorn Army Ammunition Plant
MCL	Maximum contaminant level
MMM	Monthly Managers' Meeting
MNA	Monitored natural attenuation
PBR	Performance-Based Remediation
PII	Personally identifiable information
PP	Proposed Plan
PS	Praveen Srivastav
PSI	Post-Screening Investigation
PVC	Polyvinyl chloride
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RA(O)	Remedial Action – Operation
RAWP	Remedial Action Work Plan
RD	Remedial Design
RM	Rich Mayer
RMZ	Rose M. Zeiler
ROD	Record of Decision
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TOC	Total organic carbon
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

LHAAP Data Validated
November 2019 MMM

GWTP Effluent	*Weekly Perchlorate Sampling – October 2019* Perchlorate (6850)
GWTP Effluent	*Weekly, Bi-Weekly, and Monthly Sampling – October 2019* Ammonia (350.3) Ortho-Phosphate (365.3) Organic Carbon (415.1) VOC (8260C) Metals (6020A) Hexavalent Chromium (7196A) 1,4-Dioxane (8270D-SIM) Anions (9056)
GWTP Influent	*Monthly Sampling – October 2019* Metals (6020A) Perchlorate (6850) Hexavalent Chromium (7196A)
LHAAP Surface Water	*Quarterly Perchlorate Sampling - October 2019* Perchlorate (6850)
LHAAP-16	*October 2018 and September 2019 Baseline Sampling* VOCs (SW8260) Perchlorate (EPA 6850) DHC (Census count) Dissolved Gases (RSK-175) Alkalinity (SM2320B) Anions (SW9056) TOC (SM5310) Metals (SW6020)

GWTP Weekly/Effluent Perchlorate Sampling -October 2019

Location ID: / Sample Date:	Units	Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_100119_AIX 10/1/19	LH18/24-SP650_100819_ AIX 10/8/19	LH18/24-SP650_100819_AIX 10/8/19	LH18/24-SP650_101519_AIX 10/15/19	LH18/24-SP650_102219_AIX 10/22/19	LH18/24-SP650_102919_AIX 10/29/19
Location Description				**Collected from a spigot on the discharge of effluent TK-650.**					
				Weekly	Monthly EFF	Weekly	Weekly	Weekly	Weekly
Perchlorate (6850)									
Perchlorate	µg/L	589	17	< 2.0 U	**6.0**	**6.9**	< 2.0 U	**1.7 J**	< 2.0 U

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

AIX - after ion exchange

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

MCL - maximum contaminant level

GWTP Weekly Sampling - October 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_100119 10/1/19	LH18/24-SP650_100819 10/8/19	LH18/24-SP650_101519 10/15/19	LH18/24-SP650_102219 10/22/19	LH18/24-SP650_102919 10/29/19
Location Description			**GWTP–Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.**				
Ammonia as N (350.3)							
Ammonia as N	mg/L	NV	**5.2**	**0.32**	**18**	**5.9**	**7.8**
Ortho-Phosphate (365.3)							
Ortho-Phosphate	mg/L	NV	**1.33**	**3.36**	**2.54**	**4.06**	**2.17**
Organic Carbon (SM5310C)							
Total Organic Carbon (TOC)	mg/L	NV	**1.83**	**2.14**	**1.3**	**1.56**	**4.2**

mg/L - milligrams per liter

NV - No Value

GWTP Bi-Weekly Sampling - October 2019

Location ID: / Sample Date:	Units	(Bayou) Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_100119 10/1/19	LH18/24-SP650_101019 10/10/19	LH18/24-SP650_101519 10/15/19	LH18/24-SP650_101719 10/17/19	LH18/24-SP650_102419 10/24/19*	LH18/24-SP650_102919 10/29/19*
Location Description				**GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Biweekly.**					
Volatile Organic Compounds (8260C)									
1,1,1-Trichloroethane	µg/L	7,230	200	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
1,1,2-Trichloroethane	µg/L	216.9	5	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
1,1-Dichloroethane	µg/L	14,032	NV	< 1.0 U	< 1.0 U	NA	< 0.50 UJ	< 0.50 U	< 0.50 U
1,1-Dichloroethene	µg/L	253	7	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
1,2-Dichloroethane	µg/L	181	5	0.37 UB	< 1.0 U	NA	**1.2**	**1.4**	**1.0**
1,2-Dichloropropane	µg/L	5	5	< 1.0 U	< 1.0 U	NA	< 0.50 UJ	< 0.50 U	< 0.50 U
Acetone	µg/L	2,395	NV	5.1 UB	**5.3**	NA	< 0.50 U	< 0.50 U	< 0.50 U
Benzene	µg/L	181	5	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
Carbon tetrachloride	µg/L	181	5	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
Chlorobenzene	µg/L	47,180	100	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
Chloroform	µg/L	3,615	NV	< 1.0 U	< 1.0 U	NA	< 0.50 UJ	< 0.50 U	< 0.50 U
cis-1,2-Dichloroethene	µg/L	NV	70	**2.2**	**2.4**	NA	**12 J**	**21**	**30**
Ethylbenzene	µg/L	57,025	700	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
m,p-Xylene	µg/L	83.6	NV	< 2.0 U	< 2.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	1,699	5	< 1.0 U	< 1.0 U	NA	< 1.0 U	**22**	**14**
o-Xylene	µg/L	83.6	NV	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
Styrene	µg/L	5,987	100	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
Tetrachloroethene	µg/L	180.7	5	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
Toluene	µg/L	4,189	10	< 1.0 U	< 1.0 U	NA	< 0.50 U	< 0.50 U	< 0.50 U
Trichloroethene	µg/L	181	5	**0.98 J**	**1.2**	NA	**1.0**	**1.7**	**5.1**
Vinyl chloride	µg/L	72	2	< 1.0 U	< 1.0 U	NA	< 0.50 U	**1.3**	**1.2**
Anions (9056)									
Chloride	mg/L	NV	NV	**496**	**NA**	**444**	**NA**	**NA**	**548**
Sulfate	mg/L	NV	NV	**101**	**NA**	**118**	**NA**	**NA**	**62.6**

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

NA - not analyzed

UJ - estimated non-detect due to quality control issues and reported to the limit of detection

UB - considered an artifact of blank contamination

*No exceedances were enountered since discharged to the Bayou.

MCL - maximum contaminant level

GWTP Monthly Effluent Sampling - October 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_100819 10/8/19
Location Description				GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled monthly
Volatile Organic Compounds (8260C)				
1,1,1-Trichloroethane	µg/L	7,230	200	< 0.5 U
1,1,2-Trichloroethane	µg/L	216.9	5	< 0.5 U
1,1-Dichloroethane	µg/L	14,032	NV	< 0.5 U
1,1-Dichloroethene	µg/L	253	7	< 0.5 U
1,2-Dichloroethane	µg/L	181	5	< 0.5 U
1,2-Dichloropropane	µg/L	5	5	< 0.5 U
Acetone	µg/L	2,395	NV	44 UB
Benzene	µg/L	181	5	< 0.5 U
Carbon tetrachloride	µg/L	181	5	< 0.5 U
Chlorobenzene	µg/L	47,180	100	< 0.5 U
Chloroform	µg/L	3,615	NV	< 0.5 U
cis-1,2-Dichloroethene	µg/L	NV	70	**1.8**
Ethylbenzene	µg/L	57,025	700	< 0.5 U
m,p-Xylene	µg/L	83.6	NV	< 1.0 U
Methylene chloride	µg/L	1,699	5	< 1.0 U
o-Xylene	µg/L	83.6	NV	< 0.5 U
Styrene	µg/L	5,987	100	< 0.5 U
Tetrachloroethene	µg/L	180.7	5	< 0.5 U
Toluene	µg/L	4,189	10	< 0.5 U
Trichloroethene	µg/L	181	5	**0.80 J**
Vinyl chloride	µg/L	72	2	< 0.5 U
Metals (6020A)				
Barium	mg/L	2	2	**0.0770**
Lead	mg/L	0.0046	0.015	< 0.00100 U
Selenium	mg/L	0.012	0.05	< 0.00250 U
Silver	mg/L	0.003	0.1	< 0.000500 U
Hexavalent Chromium (7196A)				
Hexavalent Chromium	mg/L	0.1244	NA	**0.00900 J**
Semi-Volatile Organic Compounds (8270D SIM)				
1,4-Dioxane	µg/L	134.2	NA	**23**

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

UB - considered an artifact of blank contamination

MCL - maximum contaminant level

GWTP Monthly Influent Sampling - October 2019

Location ID: Sample Date:	Units	LH18/24-SP140_100819 10/8/19
Location Description		**GWTP – Collected from a spigot on the influent to TK-140. Sampled Monthly.**
Metals (6020A)		
Selenium	mg/L	< 0.00250 U
Silver	mg/L	< 0.000500 U
Hexavalent Chromium (7196A)		
Hexavalent Chromium	mg/L	< 0.0100 U
Perchlorate (6850)		
Perchlorate	μg/L	**12,000**

mg/L - milligrams per liter

μg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

LHAAP-Quarterly Surface Water Sampling - October 2019

Location ID: Sample Date:	Units	PCL	HBW7-103119 10/31/19	HBW10_103119 10/31/19	HBW1_103119 10/31/19	HBW1_103119_a 10/31/19	GPW1_103119 10/31/19	GPW3_103119 10/31/19
Perchlorate (6850)			Harrison Bayou				Goose Prairie Creek	
Perchlorate	µg/L	17	**1.6 J**	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

µg/L - micrograms per liter

U - Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

Exceeded PCL screening criteria

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16EW02				16EW05		16EW06				16EW07		16EW08		16EW11		16EW12B	
		Sample ID	16EW02-181009		16EW02-190918		16EW05-181011		16EW06-181009		16EW06-190918		16EW07-181013		16EW08-181013		16EW11-181013		16EW12B-181013	
		Sample Date	10/9/2018		9/18/2019		10/11/2018		10/9/2018		9/18/2019		10/13/2018		10/13/2018		10/13/2018		10/13/2018	
		Location Description	Shallow; Inside Mid-Plume ISB Area				Intermediate; Inside Mid-plume ISB Area		Intermediate; Inside Mid-plume ISB Area				Intermediate; Inside Mid-plume ISB Area		Intermediate; Inside Mid-plume ISB Area		Shallow; Within Landfill Biobarrier #2		Shallow; Within Landfill Biobarrier #2	
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																				
1,1-Dichloroethene	µg/L	7	100		110				25		22	J								
1,2-Dichloroethane	µg/L	5	< 25	U	51				4.6	J	< 12	U								
cis-1,2-Dichloroethene	µg/L	70	16000		25000				3700		3700									
Methylene chloride	µg/L	5	< 50	U	< 25	U			< 5	U	< 25	U								
1,1,2-Trichloroethane	µg/L	5	< 25	U	< 12	U			< 2.5	U	< 12	U								
Trichloroethene	µg/L	5	24000		42000				5500		6500									
Vinyl chloride	µg/L	2	470		650				240		190									
PERCHLORATE																				
Perchlorate	µg/L	17[a]	< 2	U	< 2	U			< 2	U	42									
DHC																				
Dehalococcoides	CEQ/ML	NV	0.2	J					1.7											
DISSOLVED GASES																				
Ethane	µg/L	NV	1.16						0.31	J										
Ethylene	µg/L	NV	8.81						3.76											
Methane	µg/L	NV	33.6						8.39											
GENERAL CHEMISTRY																				
Alkalinity	mg/L	NV	438						438											
Bromide	mg/L	NV	2.66				3.1		3.38				2.14		1.11		4.68		3.82	
Nitrate	µg/L	10000	< 100	U					< 0.2	U										
Sulfate	mg/L	NV	2130						6120											
Total organic carbon	mg/L	NV	10.3						31											
METALS																				
Arsenic	µg/L	10																		
Chromium	µg/L	100																		
Manganese	µg/L	7820[b]																		
Nickel	µg/L	490[a]																		
Thallium	µg/L	2																		

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16EW13		16EW14B		16EW15		16SW01				16SW02		16SW03		16WW12			
		Sample ID	16EW13-181013		16EW14B-181013		16EW15-181013		16SW01-181011-FD		16SW01-181011		16SW02-181011		16SW03-181011		16WW12-181012		16WW12-190918	
		Sample Date	10/13/2018		10/13/2018		10/13/2018		10/11/2018		10/11/2018		10/11/2018		10/11/2018		10/12/2018		9/18/2019	
		Location Description	Shallow; Within Landfill Biobarrier #2		Shallow; Within Landfill Biobarrier #2		Shallow; Within Landfill Biobarrier #2		Surface Water; Downstream Location				Surface Water; Adjacent to Site		Surface Water; Upstream Location		Shallow; Upgradient to Bayou Biobarrier			
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																				
1,1-Dichloroethene	µg/L	7							< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 5	U	4.9	J
1,2-Dichloroethane	µg/L	5							< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**16**		**9.2**	
cis-1,2-Dichloroethene	µg/L	70							< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**86**		52	
Methylene chloride	µg/L	5							< 1	U	< 1	U	< 1	U	< 1	U	< 10	U	< 5	U
1,1,2-Trichloroethane	µg/L	5							< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 5	U	< 2.5	U
Trichloroethene	µg/L	5							< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**4100**		**2100**	
Vinyl chloride	µg/L	2							< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**12**		**5.5**	
PERCHLORATE																				
Perchlorate	µg/L	17[a]							< 2	U	< 2	U	< 2	U	< 2	U	12		**120**	
DHC																				
Dehalococcoides	CEQ/ML	NV																		
DISSOLVED GASES																				
Ethane	µg/L	NV																		
Ethylene	µg/L	NV																		
Methane	µg/L	NV																		
GENERAL CHEMISTRY																				
Alkalinity	mg/L	NV																		
Bromide	mg/L	NV	2.91		1.4		1.86										3.9			
Nitrate	µg/L	10000																		
Sulfate	mg/L	NV																		
Total organic carbon	mg/L	NV																		
METALS																				
Arsenic	µg/L	10							2.12		2.04		1.98	J	1.94	J				
Chromium	µg/L	100							0.515	J	0.499	J	< 1	U	< 1	U				
Manganese	µg/L	7820[b]							586		545		485		360					
Nickel	µg/L	490[a]							7.86		7.56		7.25		6.68					
Thallium	µg/L	2							< 1	U	0.418	J	< 1	U	< 1	U				

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

[b] - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

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

mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW13				16WW14				16WW16				16WW21		16WW22			
		Sample ID	16WW13-181012		16WW13-190918		16WW14-181010		16WW14-190916		16WW16-181010		16WW16-190916		16WW21-181012		16WW22-181010		16WW22-190917	
		Sample Date	10/12/2018		9/18/2019		10/10/2018		9/16/2019		10/10/2018		9/16/2019		10/12/2018		10/10/2018		9/17/2019	
		Location Description	Intermediate; Downgradient of Landfill				Shallow; Upgradient to Landfill Biobarrier #3				Shallow; Upgradient to Landfill Biobarrier #2				Shallow; Downgradient of Mid-Plume ISB Area		Shallow; Upgradient to Bayou Biobarrier			
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																				
1,1-Dichloroethene	µg/L	7	< 5	U	0.7	J	< 0.5	U	< 0.5	U	< 25	U	**25**		< 0.5	U	1.9		< 0.5	U
1,2-Dichloroethane	µg/L	5	< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 25	U	**19**	J	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	**1700**		**210**		2.6		0.79	J	**8500**		**6600**		< 0.5	U	19		2.7	
Methylene chloride	µg/L	5	< 10	U	< 1	U	< 1	U	< 1	U	< 50	U	< 25	U	< 1	U	< 1	U	< 1	U
1,1,2-Trichloroethane	µg/L	5	< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 25	U	< 12	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	**4400**		**630**		**42**		**25**		**21000**		**13000**		< 0.5	U	**150**		**34**	
Vinyl chloride	µg/L	2	**51**		**5.6**		1.1		< 0.5	U	**330**		**220**		< 0.5	U	**4.5**		0.44	J
PERCHLORATE																				
Perchlorate	µg/L	17[a]	< 2	U	< 2	U	< 2	U	< 2	U	**420**		**460**		< 2	U	5.5		< 2	U
DHC																				
Dehalococcoides	CEQ/ML	NV									0.5	U					5.2			
DISSOLVED GASES																				
Ethane	µg/L	NV									2.31						< 1	U		
Ethylene	µg/L	NV									4.98						1.56			
Methane	µg/L	NV									403						2.46			
GENERAL CHEMISTRY																				
Alkalinity	mg/L	NV									362						239			
Bromide	mg/L	NV	0.929								4.69				0.218		4.46			
Nitrate	µg/L	10000									< 100	U					< 0.1	U		
Sulfate	mg/L	NV									722						772			
Total organic carbon	mg/L	NV									4.34						2.62			
METALS																				
Arsenic	µg/L	10																		
Chromium	µg/L	100																		
Manganese	µg/L	7820[b]																		
Nickel	µg/L	490[a]																		
Thallium	µg/L	2																		

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

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mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW23				16WW24						16WW25					
		Sample ID	16WW23-181012		16WW23-190917		16WW24-181009		16WW24-181009-FD		16WW24-190917		16WW25-181009		16WW25-190919		16WW25-190919-FD	
		Sample Date	10/12/2018		9/17/2019		10/9/2018		10/9/2018		9/17/2019		10/9/2018		9/19/2019		9/19/2019	
		Location Description	Intermediate; Downgradient of Landfill				Shallow; Cross-gradient to South of Plume						Intermediate; Upgradient of Mid-Plume ISB Area / Downgradient of Landfill Biobarrier #1					
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																		
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Methylene chloride	µg/L	5	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
PERCHLORATE																		
Perchlorate	µg/L	17[a]	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
DHC																		
Dehalococcoides	CEQ/ML	NV					1.6						0.5	U				
DISSOLVED GASES																		
Ethane	µg/L	NV					0.256	J	0.555	J			0.316	J				
Ethylene	µg/L	NV					1.39	J	1.24				0.954	J				
Methane	µg/L	NV					1.65		3.27				13.7					
GENERAL CHEMISTRY																		
Alkalinity	mg/L	NV					< 5	U	< 5	U			69					
Bromide	mg/L	NV					1.26		1.32				2.86					
Nitrate	µg/L	10000					< 100	U	< 0.1	U			< 100	U				
Sulfate	mg/L	NV					905		898				5710					
Total organic carbon	mg/L	NV					2.76		2.65				23.8					
METALS																		
Arsenic	µg/L	10																
Chromium	µg/L	100																
Manganese	µg/L	7820[b]																
Nickel	µg/L	490[a]																
Thallium	µg/L	2																

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

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mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW26						16WW27				16WW29				16WW30			
		Sample ID	16WW26-181009		16WW26-190917		16WW26-190917-FD		16WW27-181012		16WW27-190917		16WW29-181015		16WW29-190918		16WW30-181012		16WW30-190918	
		Sample Date	10/9/2018		9/17/2019		9/18/2019		10/12/2018		9/17/2019		10/15/2018		9/18/2019		10/12/2018		9/18/2019	
		Location Description	Shallow; Downgradient to Landfill Biobarrier #1						Intermediate; Downgradient Outside of Contaminated Area				Intermediate; Downgradient of Mid-Plume ISB Area				Shallow; Downgradient of Mid-Plume ISB Area			
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																				
1,1-Dichloroethene	µg/L	7	< 2.5	U	1.4		1.6		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	0.82	J
1,2-Dichloroethane	µg/L	5	< 2.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	**290**		35		36		< 0.5	U	< 0.5	U	8.4		< 0.5	U	< 0.5	U	**79**	
Methylene chloride	µg/L	5	< 5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,1,2-Trichloroethane	µg/L	5	< 2.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	**2400**		**380**		**440**		< 0.5	U	< 0.5	U	3.3		2.7		1.8		**360**	
Vinyl chloride	µg/L	2	**5**	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	0.41	J
PERCHLORATE																				
Perchlorate	µg/L	17[a]	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2		< 2	U	< 2	U	< 2	U
DHC																				
Dehalococcoides	CEQ/ML	NV	0.3	J									0.5							
DISSOLVED GASES																				
Ethane	µg/L	NV	0.591	J									< 1	U						
Ethylene	µg/L	NV	2.59										1.87							
Methane	µg/L	NV	10.5										2.41							
GENERAL CHEMISTRY																				
Alkalinity	mg/L	NV	12										45.9							
Bromide	mg/L	NV	< 0.1	U									0.218				3.22			
Nitrate	µg/L	10000	< 0.1	U									< 100	U						
Sulfate	mg/L	NV	1170										99.2							
Total organic carbon	mg/L	NV	5.03										1.8							
METALS																				
Arsenic	µg/L	10																		
Chromium	µg/L	100																		
Manganese	µg/L	7820[b]																		
Nickel	µg/L	490[a]																		
Thallium	µg/L	2																		

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

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mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW31				16WW32		16WW33		16WW34		16WW35				16WW36			
		Sample ID	16WW31-181010		16WW31-181010-FD		16WW32-181011		16WW33-181010		16WW34-181010		16WW35-181010		16WW35-190918		16WW36-181009		16WW36-190916	
		Sample Date	10/10/2018		10/10/2018		10/11/2018		10/10/2018		10/10/2018		10/10/2018		9/18/2019		10/9/2018		9/16/2019	
		Location Description	Intermediate; Cross-gradient Outside of Containment Area				Shallow; Cross-gradient Outside of Containment Area		Intermediate; Cross-gradient Outside of Containment Area		Shallow; Cross-gradient Outside of Containment Area		Intermediate; Upgradient of Mid-Plume ISB Area / Downgradient of Landfill Biobarrier #2				Shallow; Downgradient to Landfill Biobarrier #2			
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																				
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**190**		**120**		**450**		**190**	
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 25	U	< 12	U	**34**	J	**13**	J
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**19000**		**8800**		**66000**		**19000**	
Methylene chloride	µg/L	5	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 50	U	< 25	U	< 50	U	< 25	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 25	U	< 12	U	< 25	U	< 12	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**21000**		**13000**		**22000**		**15000**	
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**170**		**75**		**610**		**230**	
PERCHLORATE																				
Perchlorate	µg/L	17[a]	< 2	U	< 2	U	< 2		< 2	U	< 2	U	**420**		**410**		< 2	U	< 2	U
DHC																				
Dehalococcoides	CEQ/ML	NV											33.9				202			
DISSOLVED GASES																				
Ethane	µg/L	NV											0.644	J			< 1	U		
Ethylene	µg/L	NV											4.38				12.3			
Methane	µg/L	NV											55				175			
GENERAL CHEMISTRY																				
Alkalinity	mg/L	NV											969				613			
Bromide	mg/L	NV											< 0.2	U			2.7			
Nitrate	µg/L	10000											< 200	U			< 0.2	U		
Sulfate	mg/L	NV											8400				6290			
Total organic carbon	mg/L	NV											44				33			
METALS																				
Arsenic	µg/L	10																		
Chromium	µg/L	100																		
Manganese	µg/L	7820[b]																		
Nickel	µg/L	490[a]																		
Thallium	µg/L	2																		

Notes:

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µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW37		16WW38		16WW39				16WW40					
		Sample ID	16WW37-181010		16WW38-181010		16WW39-181010		16WW39-190917		16WW40-181012		16WW40-181012-FD		16WW40-190917	
		Sample Date	10/10/2018		10/10/2018		10/10/2018		9/17/2019		10/12/2018		10/12/2018		9/17/2019	
		Location Description	Intermediate; Downgradient of Landfill / Upgradient of Landfill Biobarrier #2		Shallow; Upgradient to Landfill Biobarrier #2		Shallow; Downgradient of Mid-Plume ISB Area				Shallow; Downgradient to Bayou Biobarrier					
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																
1,1-Dichloroethene	µg/L	7	< 0.5	U	**21**		< 5	U	2.7		3.5		3.5		3.7	
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 5	U	< 5	U	2		3.8		3.8		3.8	
cis-1,2-Dichloroethene	µg/L	70	5.2		**240**		**220**		**110**		**220**		**240**		**130**	
Methylene chloride	µg/L	5	< 1	U	< 10	U	< 10	U	< 1	U	< 1	U	< 1	U	< 1	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 5	U	< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	**84**		**4400**		**3900**		**1200**		**660**		**640**		**740**	
Vinyl chloride	µg/L	2	< 0.5	U	**160**		**15**		**7.1**		**4.5**		**4.2**		**3**	
PERCHLORATE																
Perchlorate	µg/L	17[a]	< 2	U	< 2	U	**120**		**130**		< 2	U	< 2	U	< 2	U
DHC																
Dehalococcoides	CEQ/ML	NV														
DISSOLVED GASES																
Ethane	µg/L	NV														
Ethylene	µg/L	NV														
Methane	µg/L	NV														
GENERAL CHEMISTRY																
Alkalinity	mg/L	NV														
Bromide	mg/L	NV					4.2				5.57		5.72			
Nitrate	µg/L	10000														
Sulfate	mg/L	NV														
Total organic carbon	mg/L	NV														
METALS																
Arsenic	µg/L	10														
Chromium	µg/L	100														
Manganese	µg/L	7820[b]														
Nickel	µg/L	490[a]														
Thallium	µg/L	2														

Notes:

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µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW41				16WW42				16WW43				16WW44		16WW45		16WW46	
		Sample ID	16WW41-181009		16WW41-190917		16WW42-181012		16WW42-190916		16WW43-181009		16WW43-190917		16WW44-181010		16WW45-181010		16WW46-181012	
		Sample Date	10/9/2018		9/17/2019		10/12/2018		9/16/2019		10/9/2018		9/17/2019		10/10/2018		10/10/2018		10/12/2018	
		Location Description	Intermediate; Downgradient of Mid- Plume ISB Area				Shallow; Downgradient to Landfill Biobarrier #1				Shallow; Cross-gradient to South of Plume				Shallow; Background		Intermediate; Background		Shallow; Downgradient Outside of Contaminated Area	
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																				
1,1-Dichloroethene	µg/L	7	**17**		**11**		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 5	U	< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	**1200**		**1300**		42		**240**		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Methylene chloride	µg/L	5	< 10	U	< 10	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,1,2-Trichloroethane	µg/L	5	< 5	U	< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	**9800**		**3900**		**6**		**29**		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	3	
Vinyl chloride	µg/L	2	**110**		**80**		< 0.5	U	1.1		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
PERCHLORATE																				
Perchlorate	µg/L	17[a]	**60**		< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
DHC																				
Dehalococcoides	CEQ/ML	NV	0.5	U							2.1									
DISSOLVED GASES																				
Ethane	µg/L	NV	0.281	J							< 1	U								
Ethylene	µg/L	NV	3.04								2.28									
Methane	µg/L	NV	6.55								133									
GENERAL CHEMISTRY																				
Alkalinity	mg/L	NV	951								104									
Bromide	mg/L	NV	3.35				0.182				0.173									
Nitrate	µg/L	10000	< 200	U							< 0.1	U								
Sulfate	mg/L	NV	9260								6.35									
Total organic carbon	mg/L	NV	58								9.46									
METALS																				
Arsenic	µg/L	10																		
Chromium	µg/L	100																		
Manganese	µg/L	7820[b]																		
Nickel	µg/L	490[a]																		
Thallium	µg/L	2																		

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

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FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW48				16WW49		16WW51				16WW55				16WW56	
		Sample ID	16WW48-181018		16WW48-190918		16WW49-190919		16WW51-190918		16WW51-190919		16WW55-181015		16WW55-190917		16WW56-190917	
		Sample Date	10/18/2018		9/18/2019		9/19/2019		9/18/2019		9/18/2019		10/15/2018		9/17/2019		9/17/2019	
		Location Description	Shallow; Downgradient of Mid-Plume ISB Area				Intermediate; Downgradient of Mid-Plume ISB Area		Intermediate; Downgradient of Mid-Plume ISB Area				Shallow; Downgradient of Landfill Biobarrier #3				Shallow; Downgradient to Bayou Biobarrier	
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs																		
1,1-Dichloroethene	µg/L	7	**11**		7		< 0.5	U			< 0.5	U	< 5	U	**9.1**	J	< 0.5	U
1,2-Dichloroethane	µg/L	5	**12**		**7**		0.86	J			< 0.5	U	< 5	U	**5.3**	J	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	**2600**		**1800**		**130**				9.1		**540**		**310**		1.7	
Methylene chloride	µg/L	5	< 1		< 5	U	< 1	U			< 1	U	< 10	U	< 10	U	< 1	U
1,1,2-Trichloroethane	µg/L	5	< 0.5		< 2.5	U	< 0.5	U			< 0.5	U	< 5	U	< 5	U	< 0.5	U
Trichloroethene	µg/L	5	**8800**		**3700**		**260**				**90**		**5900**		**3200**		**27**	
Vinyl chloride	µg/L	2	**15**		**7.4**		< 0.5	U			< 0.5	U	< 5	U	**37**		0.41	J
PERCHLORATE																		
Perchlorate	µg/L	17[a]	14		< 2	U	< 2	U			< 2	U	**400**		**480**		< 2	U
DHC																		
Dehalococcoides	CEQ/ML	NV	0.3	J									0.5	U				
DISSOLVED GASES																		
Ethane	µg/L	NV	0.174	J									0.749	J				
Ethylene	µg/L	NV	2.19										3.79					
Methane	µg/L	NV	2.21										136					
GENERAL CHEMISTRY																		
Alkalinity	mg/L	NV	259										347					
Bromide	mg/L	NV	4.33										2.12					
Nitrate	µg/L	10000	< 200										< 100	U				
Sulfate	mg/L	NV	1770										1110					
Total organic carbon	mg/L	NV	8.78										7.32					
METALS																		
Arsenic	µg/L	10																
Chromium	µg/L	100																
Manganese	µg/L	7820[b]																
Nickel	µg/L	490[a]																
Thallium	µg/L	2																

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

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Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling
October 2018 and September 2019

		Location Code	16WW57		16WW58			
		Sample ID	16WW57-190918		16WW58-190918		16WW58-190918-FD	
		Sample Date	9/18/2019		9/18/2019		9/18/2019	
		Location Description	Intermediate; Across Harrison Bayou from Bayou Biobarrier		Intermediate; Across Harrison Bayou from Bayou Biobarrier			
Parameter	Units	MCL/PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs								
1,1-Dichloroethene	µg/L	7	0.56	J	3.9	J	3.9	J
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 2.5	U	< 2.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	170		180	
Methylene chloride	µg/L	5	< 1	U	< 5	U	< 5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 2.5	U	< 2.5	U
Trichloroethene	µg/L	5	24		4300		4100	
Vinyl chloride	µg/L	2	< 0.5	U	< 2.5	U	< 2.5	U
PERCHLORATE								
Perchlorate	µg/L	17[a]	< 2	U	< 2	U	< 2	U
DHC								
Dehalococcoides	CEQ/ML	NV	35.3		17.8			
DISSOLVED GASES								
Ethane	µg/L	NV	0.246	J	0.332	J	0.318	J
Ethylene	µg/L	NV	1.18		1.51		1.43	
Methane	µg/L	NV	2.44		3.62		4.37	
GENERAL CHEMISTRY								
Alkalinity	mg/L	NV	133		94		107	
Bromide	mg/L	NV	3.16		3.52		3.48	
Nitrate	µg/L	10000	< 0.1	U	< 100	U	< 100	U
Sulfate	mg/L	NV	2310		394		396	
Total organic carbon	mg/L	NV	10.9		4.21		4.27	
METALS								
Arsenic	µg/L	10						
Chromium	µg/L	100						
Manganese	µg/L	7820[b]						
Nickel	µg/L	490[a]						
Thallium	µg/L	2						

Notes:

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VOCs - volatile organic compounds

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Subject:	**Final Minutes, Monthly Managers' Meeting (MMM), Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Teleconference**
Date of Meeting:	**18 December 2019– 1:00 Central Standard Time (CST)**

Attendees:

Army BRAC:	Rose M. Zeiler (RMZ)
USEPA:	Rich Mayer (RM) and Kent Becher (KB)-USGS Liaison
AEC:	Amanda Sherman (AS)
TCEQ:	April Palmie (AP)
USACE:	Aaron Williams (AW)
Bhate:	Kim Nemmers (KN)
APTIM:	Bill Foss (BF), Rob Mayer and Praveen Srivastav (PS)
USFWS:	Paul Bruckwicki (PB)

Action Items

Bhate/APTIM: AS stated that the Public Affairs Office (PAO) has determined some standard language and process for adding a place on the LHAAP website for obtaining email addresses. However, the PAO has decided to not implement this at this time because no more munitions will be blown-in-place until a new contractor is selected for LHAAP-17. The action item is therefore no longer needed, until the new contract for LHAAP-17 is procured.

Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update

Groundwater Treatment Plant (GWTP) - KN started the discussion of the GWTP by explaining that the effluent was discharging to the Harrison Bayou. KN stated that the air stripper blower was installed incorrectly due to an error by the manufacturer of the sticker placement. KN explained that the blower installation had been corrected. Effluent was analyzed for volatile organic compounds (VOCs) as a rush turn around and the results were received December 17, 2019. KN explained the analytical results have trichloroethene (TCE) above the maximum contaminant level (MCL) of 5 parts per billion (ppb). KN stated that another effluent sample was collected for rush turn-around of the VOCs the day before the MMM and that the results should be available by the end of the week or Monday at the latest. Since the effluent could discharge to the bayou, the GWTP continues to operate. KN stated that the air stripper is pushing 4,000 cubic feet per minute of air through the system, which is more than it previously was able to do. However, if the results continue to have VOCs above the MCL, then Bhate will send someone out to assess the system.

LHAAP-03 – PS stated that water is still present in the excavation and a side wall at area C still needed to be excavated.

LHAAP-16- PS stated that the field team is still extracting and recirculating water from five wells, which started on December 5, 2019. As of Monday (Thursday results), bromide and total organic carbon (TOC) results were still low. PS explained that APTIM had sent this week's samples to APTIM's laboratory in Lawrenceville, NJ to expedite the sample results. PS stated that he had just received the Monday and Tuesday preliminary results, which showed that the bromide is still low but the TOC is up in all of the wells. RM asked if the bromide is moving more slowly than the TOC. PS said that they are not sure but it seems that bromide is being masked by high levels of sulfate in the groundwater. BF said that a study he had found indicates that bromide could be a poor tracer if the pH is lower than 7 and that the pH of the groundwater at LHAAP-16 is less than 7 so bromide could have attached to some of the clays. RM asked if there was a recommended alternative. BF said that he could a send a link to the site to the group but had not looked into alternatives. RM asked KB if he had used other tracers at similar sites. KB said that chlorides, nitrates and similar have been used as tracers at his sites. BF clarified that this doesn't mean that this is the case but this is just one possible explanation. PS said that over 16,700 gallons of water had been extracted as of 12/18/19 and that approximately 14,000 gallons has been reinjected. PS said that based upon the results and the amount extracted and injected, APTIM recommends ceasing recirculation. PS said that the additional water added has probably pushed the injectate out. PS reminded everyone that no pumping test was done as part of the remedial design, which has resulted in uncertainty regarding the implementation. Rob Mayer pointed out that the TOC increase was indicative of the substrate moving where it was desired. RMZ stated that the Army concurs with APTIM. RM asked if the confidence is due to the TOC. RMZ said that the TOC is a substantial increase and that the bromide could be masked as BF explained. AP asked about the data showing the TOC increase. PS stated that the data had not yet been provided. PS stated that the TOC is being detected at 40 to 80 mg/L, which is significantly higher than baseline concentrations. PS said that once the results are confirmed by the laboratory that it will be provided to the Regulators. PS stated that injections will start this Thursday or Friday and be complete this by Saturday or Sunday in time for the field crew to go home for the holidays. Regulators concurred that the approach seemed reasonable.

LHAAP-17 – PS stated that the site has been secured with chains and signs indicating "No Trespassing." PS stated that options for management of the water within the excavation that were discussed in the previous MMM were evaluated and each of the options have their own pros/cons. PS stated that BF evaluated acceptable levels for discharging of the water. BF took the 1,4-dioxane memorandum information provided by the Army and used it as the basis for calculating a discharge limit for explosives. BF said that the basis for the calculations is TCEQ guidance document RG-194 for Surface Water Quality Standards. BF stated that there were slight differences between the default values for certain variables provided in the guidance document and those used in the 1,4-dioxane memorandum. BF said he used the most conservative numbers where there were differences and the lowest discharge criteria for any of the three explosives compounds that he calculated was 2 parts per million (ppm), using a human health scenario where both water and fish tissue were consumed. The highest detection in the water at LHAAP-17 was less than 1 ppm. BF explained that the calculation is based upon dilution of the discharge using rates from the GWTP that were calculated in the 1,4-dioxane memorandum.

BF said that the current levels are acceptable for discharge at a rate similar to that of the GWTP. RM asked if the calculation sheet could be shared. RMZ pointed out that there will be a new project manager for USEPA after Christmas. AP clarified that discharge criteria comes from the TCEQ. AP asked about water flowing out of the excavations and that her prior input was not to allow overflow and discharge to surface water. BF stated that recent visits to LHAAP-17 had confirmed that the excavation nearest to the drainage ditches at LHAAP-17 (Area H) was not full and had freeboard space to accept more runoff without overflowing. BF clarified his earlier statements by explaining he was not saying the dilution value used in the calculation was based upon water flowing in but more about the dilution with the bayou if we were to pump out the excavation.

AP said that she understood the currently considered options for water management to be a) direct discharge, b) treatment via the GWTP and then c) land application. BF asked if land application was even an option. AP said that land application is allowed and has its own calculations. BF asked if it would be similar to that of wastewater irrigation application. AP said that the water has to be intended for beneficial reuse and that she thinks the calculations are the same as wastewater irrigation application. AP said that discharging to the bayou (a or b) is probably better than land application. KN pointed out that the perchlorate detected was not necessarily an issue if going to the bayou given the detections from the prior samples, with the exception of one sample. BF stated that the explosives are known to degrade in sunlight and could be less than previously detected in the water sampled. AP asked if the discharge criteria was something being considered for the beginning of the year. BF confirmed that it was. AP said that the calculations go to her with a copy to USEPA, and then AP verifies that the submittal is substantially complete. AP then submits to surface water quality group. RM said that the USEPA will also review. BF stated that some of the information for the 1,4-dioxane calculations are different than what is online. AP said that some of the values were changed in the 1,4-dioxane calculations based on updated guidance, and she would send over some information from the development of the perchlorate discharge criteria. RM asked when the information will be submitted. BF said that the information will be sent early in 2020. AP said that she will forward emails for the process that resulted in the perchlorate effluent calculations.

PS stated that the other issue is that the soil is not firm enough to bring in equipment and trucks to allow for backfilling.

SmartMap - RM stated that data for LHAAP-18/24 is not currently present in the SmartMap. KN concurred and said that the team was working to get the data entered. KN said that she would have an update after the holidays. RM said that the system was slow. BF said that this is due to the way the SmartMap was originally programmed to load a large amount of data before initially displaying the map, but that it speeds up once you are in the system. RM asked if a note could be added to explain that the system is slow when you first enter.

KN asked everyone to refer to the Document and Issues Tracking Table dated December 18, 2019.

- **Task 1** (Project Management) – KN stated the Restoration Advisory Board (RAB) meeting was planned for January 16, 2020. AP asked what time the Monthly Manager's Meeting (MMM) was in January. RMZ asked that we meet at 10:30 am. AS asked if there would be any site visits. RMZ pointed out that RM's replacement would need to visit some sites. KN stated that the November MMM minutes had been issued to the Regulators on December 9th, 2019.
- **Task 3** (LHAAP-03) **–** PS stated that no documents were in progress.
- **Task 4** (LHAAP-04) **–** PS stated that the Remedial Action Completion report (RACR) has been started. PS stated that the performance data from November 2019 is included in the data package for the meeting. RM asked about perchlorate detections. BF stated that several of the monitoring wells that had high detections of perchlorate had substrate in the wells and couldn't be sampled. RM asked if the well next to the fire station would be sampled. BF said that it was sampled during the baseline sampling and no perchlorate was detected.
- **Task 5** (LHAAP-12) **–** PS stated that the annual groundwater sampling had been completed the week of December 3, 2019 and that the sampling included the new well installed in August 2019.
- **Task 6** (LHAAP-16) **–** PS stated that the performance monitoring data is included with this month's validated data. PS explained that high bromide and TOC were detected in three wells that are located in Biobarriers 1 and 3.
- **Task 7** (LHAAP-17) **–** PS stated that the site had already been discussed. AP asked about putting berms or hay bales around the area. BF stated that Area H was half full at this point and had received water from upgradient. RM asked PB about his observations. PB stated that he observed surface water flowing from the north east by the road to a larger excavation area but he did not observe any water going out of the excavations.

- **Task 9** (LHAAP-37) – PS stated that the Year 3 1st semiannual sampling was done in November and will be shared in the January 2020 meeting. PS stated that the Year 2 Annual RA(O) Report is being prepared.
- **Task 10** (LHAAP-46) –PS stated that Year 5 Annual RA-O data report is in progress.
- **Task 11** (LHAAP-50) –PS stated that the Year 5 RA-O Report is being prepared. PS stated that the annual RA-O sampling was completed in November 2019 and the validated data was provided with the December 2019 MMM. Responses to Regulatory comments on Draft Remedial Action Work Plan (RAWP) are being prepared for Army review. BF said that one note regarding EPA's comment on the groundwater flow velocity is that the flow rate reported is based upon current instantaneous picture and that a different gradient and flow direction could have existed in the past.
- **Task 12** (LHAAP-58) – KN stated that the Year 5 RA (O) Report was issued draft final and Regulators concurred. KN stated that LHAAP-58 was being sampled currently and that the sampling results will likely be presented at the February 2020 MMM.
- **Task 13** (LHAAP-67) – PS stated that the draft Year 5 RA-O Report is under Army review and comment for issuance to the Regulators in January 2020. PS indicated that the site was sampled the last week of October, and that data was provided for December 2019 MMM. BF pointed out that the results for the two new wells, which are clean, was provided.
- **Task 14** (LHAAP-001-R and –003-R) - KN stated that there are no documents currently in progress.
- **Task 16** (GWTP) **–** KN indicated that the 3rd Quarter 2019 GWTP Report was issued to the Regulators today and that she would follow up with an email notification.
- **Task 17** (LHAAP-18/24) – KN stated that LHAAP-18/24 sampling had been completed in December 2019 and that the validated data will be provided at the February 2020 MMM.
- **Task 18** (Surface Water) – KN stated that the most recent surface water results are from October 2019 and that no issues were noted.
- **Task 19** (LUC Management Plan) – KN stated that the LUC Management Plan Update was completed and would be placed into the AR
- **Administrative Record –** PS stated that the next AR update is being prepared with a cutoff of June 30, 2019.

Update on other DERP Sites:

- **LHAAP 18/24** –RMZ stated that the DF ROD redlined text and Response to Comments will be issued later in the day. RMZ asked if Rich could provide an email stating whether EPA approved. RM stated that USEPA is ready to sign the ROD if the responses are acceptable. AP asked that the tables be sent out revised to show the corrections since you cannot redline in excel.
- **LHAAP-29** – AW stated that the PP and ROD are being included in the AR. AP asked AW if the next phase of work at LHAAP-29 is waiting on the completion of the LHAAP-18/24 ROD to which AW responded that it was.
- **LHAAP-47** – AW stated that the 2nd Addendum to the PSI Report was expected by the next day and that it is only five pages. AW stated that he hoped it would be out to the Regulators early the next week. RMZ asked that the Regulators let them know if there are any format issues or anything of concern. AW explained that a units issue was identified and corrected for soil. RMZ stated that correction of the error results in no exceedances in the northern portion of the site in soil. RM confirmed that groundwater is still the issue. RMZ stated that she would set up a separate call for the next morning and include a map for the discussion.

Schedule Next Managers' Meeting
The next MMM will be held on Thursday, January 16, 2020 at 10:30 am CST at the LHAAP trailer.

Meeting concluded at approximately 2:30 pm CST.

ACRONYM LIST

AEC	Army Environmental Command
AP	April Palmie
APTIM	APTIM Federal Services, LLC
AR	Administrative Record
AS	Amanda Sherman
AW	Aaron Williams
BF	Bill Foss
Bhate	Bhate Environmental Associates, Inc.
BRAC	Base Realignment and Closure
CST	Central Standard Time
DERP	Defense Environmental Restoration Program
GWTP	Groundwater Treatment Plant
KB	Kent Becher
KN	Kim Nemmers
LHAAP	Longhorn Army Ammunition Plant
MCL	Maximum contaminant level
MMM	Monthly Managers' Meeting
MNA	Monitored natural attenuation
PAO	Public Affairs Office
PBR	Performance-Based Remediation
PP	Proposed Plan
PPM	Parts per million
PS	Praveen Srivastav
PSI	Post-Screening Investigation
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RA(O)	Remedial Action – Operation
RAWP	Remedial Action Work Plan
RD	Remedial Design
RM	Rich Mayer
RMZ	Rose M. Zeiler
ROD	Record of Decision
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TOC	Total organic carbon
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

LHAAP Validated Data Packages for
December 2019 Monthly Manager's Meeting

LHAAP Area	Analytic Method
LHAAP-04	***November 2019 Baseline During Injection Sampling***
	Perchlorate (EPA 6850)
LHAAP-16	***Map of Performance Sampling Locations***
	October 2018 and September 2019 Baseline Sampling
	TOC (SM5310C)
	Bromide (SW9056A)
LHAAP-50	***Year 6 Annual RA(O) Sampling - November 2019***
	Perchlorate (EPA 6850)
	Volatile Organic Compounds (SW8260)
	Dissolved Gases (RSK-175)
	Anions (SW9056)
	Total Organic Carbon (SM5310)
LHAAP-67	***Year 6 Annual RA(O) Sampling - October 2019***
	Volatile Organic Compounds (SW8260)
	Dissolved Gases (RSK-175)
	Anions (SW9056)
	Total Organic Carbon (SM5310)
GWTP Effluent	***Weekly Perchlorate Sampling – November 2019***
	Perchlorate (6850)
GWTP Effluent	***Weekly, Bi-Weekly, and Monthly Sampling – November 2019***
	Ammonia (350.3)
	Ortho-Phosphate (365.3)
	Total Organic Carbon (SM5310)
	VOC (8260C)
	Metals (6020A)
	Hexavalent Chromium (7196A)
	1,4-Dioxane (8270D-SIM)
	Anions (9056)
GWTP Influent	***Monthly Sampling – November 2019***
	Metals (6020A)
	Perchlorate (6850)
	Hexavalent Chromium (7196A)

LHAAP-04 Baseline During Injection Sampling November 2019

		Location Code	04WW02				04WW03		04WW04	
		Sample ID	04WW02-191105		04WW02-191105-FD		04WW03-191106		04WW04-191106	
		Sample Date	11/5/2019		11/5/2019		11/6/2019		11/6/2019	
		Location Description:	Shallow Zone, Upgradient of Plume		Shallow Zone, Upgradient of Plume		Shallow Zone, Far Upgradient of Plume		Shallow Zone, Within Plume Area	
Parameter	Units	PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Perchlorate	µg/L	17	< 2	U	< 2	U	< 2	U	< 2	U

Notes:

Baseline sampling took place after injections had already started. Wells 04WW01, 04WW07, 04WW09, and 04WW10 were not sampled due to the presence of visible emulsified vegetable oil in the wells from the injections.

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level for groundwater

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

LHAAP-04 Baseline During Injection Sampling November 2019

		Location Code	04WW05		04WW06		04WW08		04WW11	
		Sample ID	04WW05-191106		04WW06-191106		04WW08-191106		04WW11-191106	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Location Description:	Shallow Zone, Within Plume Area		Shallow Zone, Cross-Gradient to Plume Area		Intermediate Zone, Slightly Upgradient of Plume Area		Shallow Zone, Downgradient of Plume	
Parameter	Units	PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Perchlorate	µg/L	17	< 2	U	< 2	U	13		< 2	U

Notes:

Baseline sampling took place after injections had already started. Wells 04WW01, 04WW07, 04WW09, and 04WW10 were not sampled due to the presence of visible emulsified vegetable oil in the wells from the injections.

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level for groundwater

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

LHAAP-04 Baseline During Injection Sampling November 2019

Location Code			Fire Station Well		LHSMW01		LHSMW02	
Sample ID			FIRE STATION WELL-		LHSMW01-191106		LHSMW02-191105	
Sample Date			11/6/2019		11/6/2019		11/5/2019	
Location Description:			Deep Zone, Cross/downgradient of Plume		Shallow Zone, Cross-Gradient to Plume Area		Shallow Zone, Downgradient to Plume Area	
Parameter	Units	PCL	Result	Val Qual	Result	Val Qual	Result	Val Qual
Perchlorate	µg/L	17	< 2	U	< 2	U	< 2	U

Notes:

Baseline sampling took place after injections had already started. Wells 04WW01, 04WW07, 04WW09, and 04WW10 were not sampled due to the presence of visible emulsified vegetable oil in the wells from the injections.

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level for groundwater

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

µg/L - micrograms per liter

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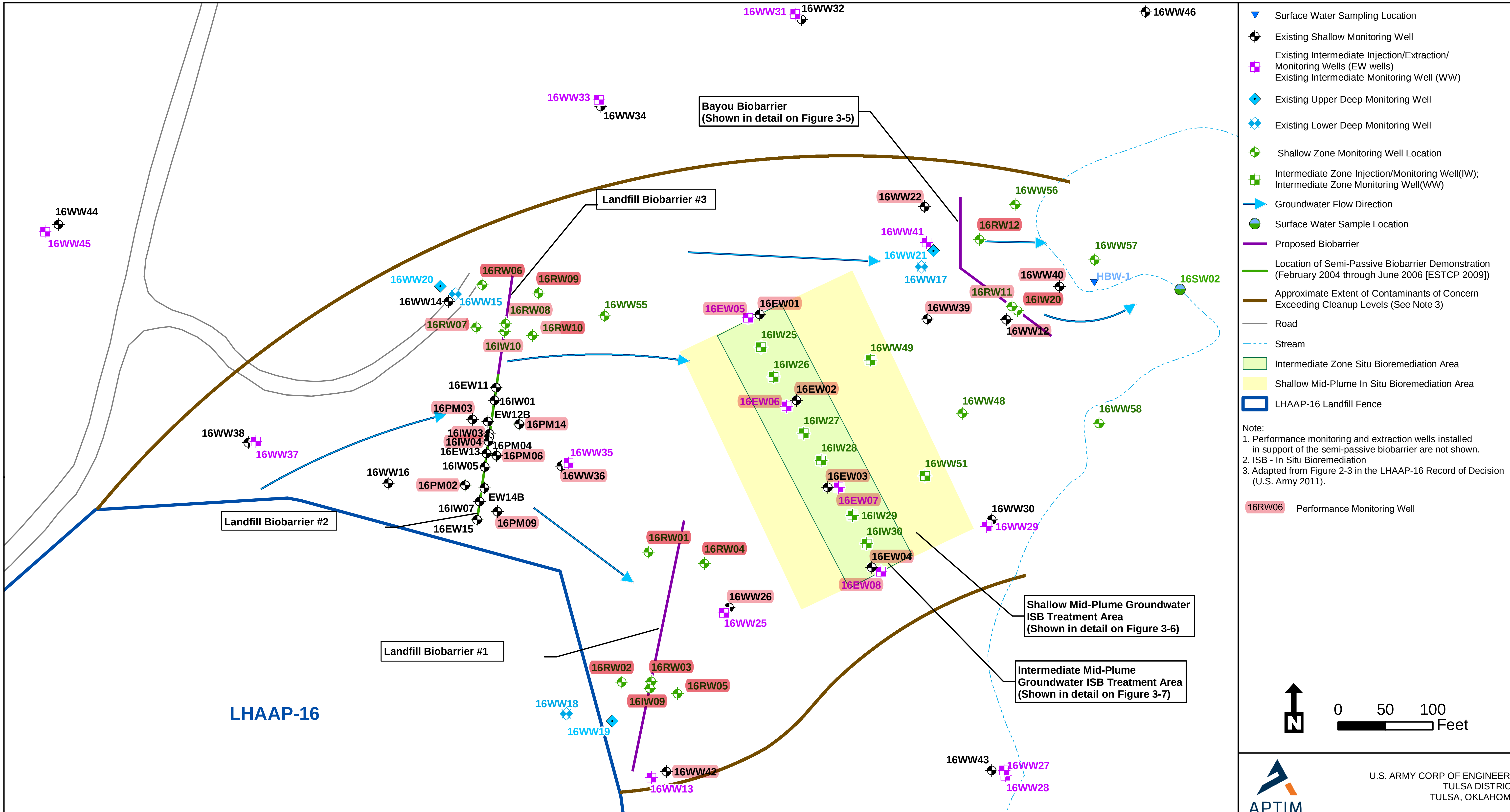
ID - identification

Val Qual - validation qualifier



APTIM
U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

Figure 3-1

Performance Monitoring Well Network

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling
October and November 2019

	Location Code	16EW01		16EW02		16EW03	
	Sample ID	16EW01-191111		16EW02-191111		16EW03-191111	
	Sample Date	11/11/2019		11/11/2019		11/11/2019	
	Location Description:	Shallow; Inside Mid-Plume ISB Area		Shallow; Inside Mid-Plume ISB Area		Shallow; Inside Mid-Plume ISB Area	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual
GENERAL CHEMISTRY							
Bromide	mg/L	3.33		1.74		5.3	
Total organic carbon	mg/L	9.06		10.3		22.6	

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling
October and November 2019

	Location Code	16EW04				16EW05							
	Sample ID	16EW04-191111		16EW04-191111-FD		16EW05-191018		16EW05-191025		16EW05-191105		16EW05-191111	
	Sample Date	11/11/2019		11/11/2019		10/18/2019		10/25/2019		11/5/2019		11/11/2019	
	Location Description:	Shallow; Inside Mid-Plume ISB Area				Intermediate; Inside Mid-plume ISB Area							
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
GENERAL CHEMISTRY													
Bromide	mg/L	2.48		2.54		3.92		1.93		2.82		2.78	
Total organic carbon	mg/L	13.6		15.3									

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling
October and November 2019

	Location Code	16EW06						16EW07					
	Sample ID	16EW06-191022		16EW06-EVENT2-191031		16EW06-191108		16EW07-191018		16EW07-191025		16EW07-191105	
	Sample Date	10/22/2019		10/31/2019		11/8/2019		10/18/2019		10/25/2019		11/5/2019	
	Location Description:	Intermediate; Inside Mid-plume ISB Area						Intermediate; Inside Mid-plume ISB Area					
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
GENERAL CHEMISTRY													
Bromide	mg/L	2.99		2.06		4.6		1.37		2.79		2.96	
Total organic carbon	mg/L												

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling
October and November 2019

Location Code		16EW08				16IW09		16IW10		16IW20		16RW01		16RW02	
Sample ID		16EW08-191022		16EW08-191106		16IW09-191119		16IW10-191120		16IW20-191022		16RW01-191119		16RW02-191119	
Sample Date		10/22/2019		11/6/2019		11/19/2019		11/20/2019		10/22/2019		11/19/2019		11/19/2019	
Location Description:		Intermediate; Inside Mid-plume ISB Area				Shallow; Landfill Biobarrier #1 Area		Shallow; Landfill Biobarrier #3 Area		Shallow; Bayou Biobarrier Area		Shallow; Upgradient of Landfill Biobarrier #1		Shallow; Upgradient of Landfill Biobarrier #1	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
GENERAL CHEMISTRY															
Bromide	mg/L	20.6		41.8		70.7		201		4.09		0.52		0.13	
Total organic carbon	mg/L					7820		1850		38		3.66		4.37	J

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling
October and November 2019

	Location Code	16RW03		16RW04				16RW05		16RW06				16RW07	
	Sample ID	16RW03-191119		16RW04-191119		16RW04-191119-FD		16RW05-191119		16RW06-191120		16RW06-191120-FD		16RW07-191120	
	Sample Date	11/19/2019		11/19/2019		11/19/2019		11/19/2019		11/20/2019		11/20/2019		11/20/2019	
	Location Description:	Shallow; Within Landfill Biobarrier #1		Shallow; Downgradient of Landfill Biobarrier #1				Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Upgradient of Landfill Biobarrier #3				Shallow; Upgradient of Landfill Biobarrier #3	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
GENERAL CHEMISTRY															
Bromide	mg/L	0.713		0.66		0.656		75.4		5.03		5.05		4.25	
Total organic carbon	mg/L	2.51	J	2.81		2.8		791		1.54		1.55		1.59	

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling
October and November 2019

Location Code		16RW08		16RW09		16RW10		16RW11		16RW12				16WW12	
Sample ID		16RW08-191120		16RW09-191120		16RW10-191120		16RW11-191022		16RW12-191022		16RW12-191022-FD		16WW12-191022	
Sample Date		11/20/2019		11/20/2019		11/20/2019		10/22/2019		10/22/2019		10/22/2019		10/22/2019	
Location Description:		Shallow; Within Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Within Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier				Shallow; Upgradient of Bayou Biobarrier	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
GENERAL CHEMISTRY															
Bromide	mg/L	6.06		4.53		3.99		213		3.85		3.9		3.56	
Total organic carbon	mg/L	2.02		1.99		4.08		3290		1.78		1.91		7.51	

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling
October and November 2019

	Location Code	16WW22		16WW26		16WW39		16WW40		16WW42	
	Sample ID	16WW22-191022		16WW26-191119		16WW39-191022		16WW40-191022		16WW42-191119	
	Sample Date	10/22/2019		11/19/2019		10/22/2019		10/22/2019		11/19/2019	
	Location Description:	Shallow; Upgradient of Bayou Biobarrier		Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Upgradient of Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier		Shallow; Downgradient of Landfill Biobarrier #3	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
GENERAL CHEMISTRY											
Bromide	mg/L	3.5		0.262		4.96		4.49		0.662	
Total organic carbon	mg/L	1.84		2.38		3.53		7.72		3.94	

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

LHAAP-50 Year 6 Annual RA(O) Sampling
November 2019

		Location Code	50WW05		50WW06		50WW08		50WW09			
		Sample ID	50WW05-191108		50WW06-191112		50WW08-191112		50WW09-191111		50WW09-191111-FD	
		Sample Date	11/8/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019	
		Location Description:	Site 50 - NE, lower shallow, outside site boundary.		Site 50 - ENE, outside site boundary.		Site 50 - E, upper shallow, inside site boundary.		Site 50 - E, lower shallow, inside site boundary.			
Parameter	Units	MCL/PCL[a]	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
PERCHLORATE												
Perchlorate	µg/L	17 [a]	< 2	U	**4300**		**83**		6.6		7.4	
VOLATILES												
1,1-Dichloroethene	µg/L	7	4.8		< 0.5	U	1.2		< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	2.7		< 0.5	U	2.2		< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	**200**		1.2		39		4.1		4	
Tetrachloroethene	µg/L	5	1.2		< 0.5	U	1.3		< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	**290**		**41**		**420**		**30**		**30**	
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
GASES												
Carbon dioxide	µg/L	NV			120000		69000					
Ethane	µg/L	NV			< 0.47	U	< 0.47	U				
Ethylene	µg/L	NV			< 0.55	U	< 0.55	U				
Methane	µg/L	NV			1.1	J	3					
GENERAL CHEMISTRY												
Chloride	mg/L	NV			84.1		361					
Nitrate	mg/L	10			< 0.1	U	0.118					
Sulfate	mg/L	NV			20.8		304					
Total organic carbon	mg/L	NV			1.63		0.83					

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

00953964

LHAAP-50 Year 6 Annual RA(O) Sampling
November 2019

		Location Code	50WW10		50WW11		50WW12				50WW13		50WW14	
		Sample ID	50WW10-191111		50WW11-191112		50WW12-191112		50WW12-191112-FD		50WW13-191113		50WW14-191113	
		Sample Date	11/11/2019		11/12/2019		11/12/2019		11/12/2019		11/13/2019		11/13/2019	
		Location Description:	Site 50 - E, intermediate, inside site boundary.		Site 50 - ENE, upper shallow, outside site boundary.		Site 50 - ENE, upper shallow, outside site boundary.				Site 50 - E, upper shallow, outside site boundary.		Site 50 - E, lower shallow, outside site boundary, along S. Crockett Ave.	
Parameter	Units	MCL/PCL[a]	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
PERCHLORATE														
Perchlorate	µg/L	17 [a]	< 2	U	8000		47000		43000		4900		< 2	U
VOLATILES														
1,1-Dichloroethene	µg/L	7	< 0.5	U	26		4.6		4.1		17	J	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	28		2.7		2.7		39		< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	58		< 0.5	U	0.76	J	230		1.7	
Tetrachloroethene	µg/L	5	< 0.5	U	< 5	U	< 0.5	U	< 0.5	U	< 12	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	3300		280		260		7300		37	
Vinyl chloride	µg/L	2	< 0.5	U	< 5	U	< 0.5	U	< 0.5	U	< 12	U	< 0.5	U
GASES														
Carbon dioxide	µg/L	NV			270000		250000		300000		86000		97000	
Ethane	µg/L	NV			< 0.47	U	< 0.47	U	< 0.47	U	< 0.47	U	< 0.47	U
Ethylene	µg/L	NV			< 0.55	U	< 0.55	U	< 0.55	U	< 0.55	U	< 0.55	U
Methane	µg/L	NV			6.8		1.5		1.6		4.7		1.8	
GEN CHEMISTRY														
Chloride	mg/L	NV			294		1070		1060		308		395	
Nitrate	mg/L	10			< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U
Sulfate	mg/L	NV			351		531		533		316		357	
Total organic carbon	mg/L	NV			1.49		1.11		1.19		1.78		0.88	

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

LHAAP-50 Year 6 Annual RA(O) Sampling
November 2019

		Location Code	50WW15		50WW16		50WW17		50WW18		50WW21		50WW22	
		Sample ID	50WW15-191108		50WW16-191113		50WW17-191108		50WW18-191108		50WW21-191108		50WW22-191112	
		Sample Date	11/8/2019		11/13/2019		11/8/2019		11/8/2019		11/8/2019		11/12/2019	
		Location Description:	Site 50 - NNE, upper shallow, outside site boundary, along Goose Prairie Creek bridge.		Site 50 - NE, upper shallow, outside site boundary, along Goose Prairie Creek.		Site 50 - NE, fully penetrating shallow, outside site, near Goose Prairie Creek.		Site 50 - NE, upper shallow, outside site boundary, along Goose Prairie Creek.		Site 50 - E, upper shallow, outside site boundary, east side of S. Crockett Ave.		Site 50 - SE, upper shallow, outside site boundary.	
Parameter	Units	MCL/PCL[a]	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
PERCHLORATE														
Perchlorate	µg/L	17 [a]	< 2	U	1.6	J	< 2	U	< 2	U	< 2	U	< 2	U
VOLATILES														
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	5.5		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	2.1		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	7.2		1.5		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	1.7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
GASES														
Carbon dioxide	µg/L	NV			26000								79000	
Ethane	µg/L	NV			< 0.47	U							< 0.47	U
Ethylene	µg/L	NV			< 0.55	U							< 0.55	U
Methane	µg/L	NV			3								0.55	J
GEN CHEMISTRY														
Chloride	mg/L	NV			6.07								773	
Nitrate	mg/L	10			< 0.1	U							< 0.1	U
Sulfate	mg/L	NV			28.7								587	
Total organic carbon	mg/L	NV			1.05								1.01	

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

LHAAP-50 Year 6 Annual RA(O) Sampling
November 2019

		Location Code	50WW23		50WW24		50WW27		50WW29	
		Sample ID	50WW23-191113		50WW24-191108		50WW27-191108		50WW29-191111	
		Sample Date	11/13/2019		11/8/2019		11/8/2019		11/11/2019	
		Location Description:	Site 50 - E, upper shallow, outside site boundary.		Site 50 - ENE, upper shallow, outside site boundary.		Site 50 - N, upper shallow, outside site boundary, east of S. Crockett Ave.		Site 50 - ENE, upper shallow	
Parameter	Units	MCL/PCL[a]	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
PERCHLORATE										
Perchlorate	µg/L	17 [a]	< 2	U	< 2	U	< 2	U	< 2	U
VOLATILES										
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	0.92	J	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
GASES										
Carbon dioxide	µg/L	NV	190000							
Ethane	µg/L	NV	< 0.47	U						
Ethylene	µg/L	NV	< 0.55	U						
Methane	µg/L	NV	< 1	U						
GEN CHEMISTRY										
Chloride	mg/L	NV	1290							
Nitrate	mg/L	10	0.104							
Sulfate	mg/L	NV	181							
Total organic carbon	mg/L	NV	0.2	J						

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

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LHAAP-67 Year 6 Annual RA(O) Sampling
October 2019

		Location Code	67WW01		67WW02		67WW05		67WW07	
		Sample ID	67WW01-191024		67WW02-191024		67WW05-191024		67WW07-191028	
		Sample Date	10/24/2019		10/24/2019		10/24/2019		10/28/2019	
		Location Description:	Site 67-Central, within site boundary.		Site 67 - NW, within site boundary.		Site 67 - WNW, outside site boundary.		Site 67 - E, outside site boundary.	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOLATILES										
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	0.53	J	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	70		34		< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	7.6		< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	0.53	J	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
GASES										
Carbon dioxide	µg/L	NV								
Ethane	µg/L	NV								
Ethylene	µg/L	NV								
Methane	µg/L	NV								
GENERAL CHEMISTRY										
Chloride	mg/L	NV								
Nitrate	mg/L	10								
Sulfate	µg/L	NV								
Total organic carbon	mg/L	NV								

Notes:

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

LHAAP-67 Year 6 Annual RA(O) Sampling
October 2019

		Location Code	67WW08				67WW09		67WW09A	
		Sample ID	67WW08-191028		67WW08-191028-FD		67WW09-191024		67WW09A-191028	
		Sample Date	10/28/2019		10/28/2019		10/24/2019		10/28/2019	
		Location Description:	Site 67-S, within site boundary.				Site 67-S outside site boundary.		Site 67 - S outside site boundary.	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOLATILES										
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	63		65		< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	2.3		2.4		< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
GASES										
Carbon dioxide	µg/L	NV	110000		130000					
Ethane	µg/L	NV	< 0.47	U	< 0.47	U				
Ethylene	µg/L	NV	< 0.55	U	< 0.55	U				
Methane	µg/L	NV	2.1		2.5					
GENERAL CHEMISTRY										
Chloride	mg/L	NV	1890		1920					
Nitrate	mg/L	10	< 200	U	< 200	U				
Sulfate	µg/L	NV	513000		515000					
Total organic carbon	mg/L	NV	1.23		1.38	J				

Notes:

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

LHAAP-67 Year 6 Annual RA(O) Sampling
October 2019

		Location Code	67WW10		67WW11		67WW12		67WW13		67WW14	
		Sample ID	67WW10-191028		67WW11-191024		67WW12-191028		67WW13-191028		67WW14-191024	
		Sample Date	10/28/2019		10/24/2019		10/28/2019		10/28/2019		10/24/2019	
		Location Description:	Site 67 - SE, outside site boundary.		Site 67- SW, outside site boundary.		Site 67 - NE, within site boundary.		Site 67 - NE, within site boundary.		Site 67 - SW, outside the site boundary	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOLATILES												
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	5		< 0.5	U
1,1-Dichloroethene	µg/L	7	< 0.5	U	1.9		17		640		7.4	
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	36		1.5	
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	1.8		< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	2.6		< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	0.82	J	< 0.5	U
GASES												
Carbon dioxide	µg/L	NV							140000			
Ethane	µg/L	NV							< 0.47	U		
Ethylene	µg/L	NV							< 0.55	U		
Methane	µg/L	NV							< 1	U		
GENERAL CHEMISTRY												
Chloride	mg/L	NV							1280000			
Nitrate	mg/L	10							< 0.2	U		
Sulfate	µg/L	NV							304000			
Total organic carbon	mg/L	NV							1.69			

Notes:

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

LHAAP-67 Year 6 Annual RA(O) Sampling
October 2019

		Location Code	67WW15		67WW16I		67WW17		67WW18			
		Sample ID	67WW15-191024		67WW16I-191024		67WW17-191024		67WW18-191024		67WW18-191024-FD	
		Sample Date	10/24/2019		10/24/2019		10/24/2019		10/24/2019		10/24/2019	
		Location Description:	67-W, outside site boundary.		67 - S, within site boundary.		67 - NW, within site boundary.		67 - N, outside site boundary.			
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOLATILES												
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	**6.4**		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	**640**	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	**27**		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	1.7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	1.5		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
GASES												
Carbon dioxide	µg/L	NV										
Ethane	µg/L	NV										
Ethylene	µg/L	NV										
Methane	µg/L	NV										
GENERAL CHEMISTRY												
Chloride	mg/L	NV										
Nitrate	mg/L	10										
Sulfate	µg/L	NV										
Total organic carbon	mg/L	NV										

Notes:

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

GWTP Weekly/Effluent Perchlorate Sampling -November 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	INF pond (MCL)	LH18/24-SP650_110519 11/5/19	LH18/24-SP650_110519_AIX 11/5/19	LH18/24-SP650_111219_AIX 11/12/19	LH18/24-SP650_112019_AIX 11/20/19	LH18/24-SP650_112619_AIX 11/26/19
Location Description				**Collected from a spigot on the discharge of effluent TK-650.**				
				Weekly	Monthly EFF	Weekly	Weekly	Weekly
Perchlorate (6850)								
Perchlorate	μg/L	589	17	< 2.0 U	< 2.0 U	< 2.0 U	**11**	< 2.0 U

μg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

AIX - after ion exchange

GWTP Weekly Sampling - November 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_110519 11/5/19	LH18/24-SP650_111219 11/12/19	LH18/24-SP650_112019 11/20/19	LH18/24-SP650_112619 11/26/19
Location Description			**GWTP–Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.**			
Ammonia as N (350.3)						
Ammonia as N	mg/L	NV	**13**	**7.5**	**4.6**	**3.5**
Ortho-Phosphate (365.3)						
Ortho-Phosphate	mg/L	NV	**2.2**	**1.59**	**0.833**	**0.518**
Organic Carbon (SM5310C)						
Total Organic Carbon (TOC)	mg/L	NV	**1.98**	**1.23**	**0.90 J**	**1.3**

mg/L - milligrams per liter

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

GWTP Bi-Weekly Sampling - November 2019

Location ID: / Sample Date:	Units	(Bayou) Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_111219 11/12/19*	LH18/24-SP650_112619 11/26/19**
Location Description				**GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Biweekly.**	
Volatile Organic Compounds (8260C)					
1,1,1-Trichloroethane	µg/L	7,230	200	< 0.50 U	< 0.50 U
1,1,2-Trichloroethane	µg/L	216.9	5	< 0.50 U	< 0.50 U
1,1-Dichloroethane	µg/L	14,032	NV	< 0.50 U	< 0.50 U
1,1-Dichloroethene	µg/L	253	7	< 0.50 U	< 0.50 U
1,2-Dichloroethane	µg/L	181	5	**2.1**	**1.7**
1,2-Dichloropropane	µg/L	5	5	< 0.50 U	< 0.50 U
Acetone	µg/L	2,395	NV	< 1.0 U	< 1.0 U
Benzene	µg/L	181	5	< 0.50 U	< 0.50 U
Carbon tetrachloride	µg/L	181	5	< 0.50 U	< 0.50 U
Chlorobenzene	µg/L	47,180	100	< 0.50 U	< 0.50 U
Chloroform	µg/L	3,615	NV	< 0.50 U	< 0.50 U
cis-1,2-Dichloroethene	µg/L	NV	70	**64**	**63**
Ethylbenzene	µg/L	57,025	700	< 0.50 U	< 0.50 U
m,p-Xylene	µg/L	83.6	NV	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	1,699	5	**16**	**6.0**
o-Xylene	µg/L	83.6	NV	< 0.50 U	< 0.50 U
Styrene	µg/L	5,987	100	< 0.50 U	< 0.50 U
Tetrachloroethene	µg/L	180.7	5	< 0.50 U	< 0.50 U
Toluene	µg/L	4,189	10	< 0.50 U	< 0.50 U
Trichloroethene	µg/L	181	5	**12 J**	**12**
Vinyl chloride	µg/L	72	2	**1.7**	**0.66 J**
Anions (9056)					
Chloride	mg/L	NV	NV	**528**	**403**
Sulfate	mg/L	NV	NV	**34.8**	**33.5**

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

*released to the Bayou; no exceedances

**released to the INF pond

GWTP Monthly Effluent Sampling - November 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_BIX 11/5/19	LH18/24-SP650_AIX 11/5/19	LH18/24-SP650_110519 11/5/19
Location Description				GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled monthly		
Volatile Organic Compounds (8260C)						
1,1,1-Trichloroethane	μg/L	7,230	200	< 0.50 U	< 0.50 U	NA
1,1,2-Trichloroethane	μg/L	216.9	5	< 0.50 U	< 0.50 U	NA
1,1-Dichloroethane	μg/L	14,032	NV	< 0.50 UJ	< 0.50 U	NA
1,1-Dichloroethene	μg/L	253	7	< 0.50 U	< 0.50 U	NA
1,2-Dichloroethane	μg/L	181	5	**2.8**	**1.3**	NA
1,2-Dichloropropane	μg/L	5	5	< 0.50 UJ	< 0.50 U	NA
Acetone	μg/L	2,395	NV	< 1.0 U	< 1.0 U	NA
Benzene	μg/L	181	5	< 0.50 UJ	< 0.50 U	NA
Carbon tetrachloride	μg/L	181	5	< 0.50 U	< 0.50 U	NA
Chlorobenzene	μg/L	47,180	100	< 0.50 U	< 0.50 U	NA
Chloroform	μg/L	3,615	NV	< 0.50 U	< 0.50 U	NA
cis-1,2-dichloroethene	μg/L	NV	70	**53**	**38**	NA
Ethylbenzene	μg/L	57,025	700	< 0.50 U	< 0.50 U	NA
m,p-Xylene	μg/L	83.6	NV	< 1.0 U	< 1.0 U	NA
Methylene chloride	μg/L	1,699	5	**21 J**	**16**	NA
o-Xylene	μg/L	83.6	NV	< 0.50 U	< 0.50 U	NA
Styrene	μg/L	5,987	100	< 0.50 U	< 0.50 U	NA
Tetrachloroethene	μg/L	180.7	5	< 0.50 U	< 0.50 U	NA
Toluene	μg/L	4,189	10	< 0.50 U	< 0.50 U	NA
Trichloroethene	μg/L	181	5	**15**	**7.1**	NA
Vinyl chloride	μg/L	72	2	< 0.50 U	**0.87 J**	NA
Metals (6020A)						
Barium	mg/L	2	2	NA	NA	**0.214**
Lead	mg/L	0.0046	0.015	NA	NA	< 0.00100 U
Selenium	mg/L	0.012	0.05	NA	NA	< 0.00250 U
Silver	mg/L	0.003	0.1	NA	NA	< 0.000500 U
Hexavalent Chromium (7196A)						
Hexavalent Chromium	mg/L	0.1244	NA	NA	NA	< 0.0100 U
Semi-Volatile Organic Compounds (8270D SIM)						
1,4-Dioxane	μg/L	134.2	NA	NA	NA	**11**

μg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

UJ - estimated non-detect due to quality control issues and reported to the limit of detection

BIX - before ion exchange vessel

AIX - after ion exchange vessel

NA - not analyzed

*released to Harrison Bayou; no exceedances

GWTP Monthly Influent Sampling - November 2019

Location ID: Sample Date:	Units	LH18/24-SP140_110519 11/5/19
Location Description		**GWTP – Collected from a spigot on the influent to TK-140. Sampled Monthly.**
Metals (6020A)		
Selenium	mg/L	< 0.00250 U
Silver	mg/L	< 0.000500 U
Hexavalent Chromium (7196A)		
Hexavalent Chromium	mg/L	< 0.0100 U
Perchlorate (6850)		
Perchlorate	µg/L	**10,000**

mg/L - milligrams per liter

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

Subject: Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting
Longhorn Army Ammunition Plant (LHAAP)
Location of Meeting: Karnack Community Center, Karnack, Texas
Date of Meeting: October 23, 2019, 6:00 PM Central Daylight Time (CDT)

Meeting Participants:

Army BRAC:	Rose M. Zeiler
USACE:	Aaron Williams
USAEC:	Amanda Sherman and Troy Darr
Bhate:	Kim Nemmers
APTIM:	Bill Foss
USEPA Region 6:	Rich Mayer, Dorelle Harrison, and Kent Becher (KB)-USGS Liaison
TCEQ:	April Palmie
RAB:	Present: Judy VanDeventer, Deon Hall, John Fortune, Charles Dixon, Richard LeTourneau, and Sharron McAvoy Absent: Nigel R. Shivers, Carol Fortune; Terry Britt; John Pollard, Jr.; Tom Walker
Public:	Laura-Ashley Overdyke (Executive Director of the Caddo Lake Institute [CLI])

An agenda for the RAB meeting, a color copy of the Bhate Environmental Associates, Inc. (Bhate) slide presentation, and handouts (see list at end of meeting minutes) were provided for meeting attendees.

Welcome and Introduction

Ms. Rose Zeiler, RAB Installation Co-Chair, called the RAB meeting to order at 6:05 pm CDT. Ms. Zeiler welcomed everyone and asked if there was anyone present that had not attended before. Mr. Troy Darr stated that he was from the U.S. Army Environmental Command (USAEC) Public Affairs office and that he is in training to support environmental restoration. Mr. Darr stated that he also came to assist a person from the University of North Texas (UNT) in case he was at the meeting to shoot some video. However, the person from UNT was not at the meeting.

Ms. Zeiler explained the RAB meets every 3 months and that the purpose is to promote community awareness and obtain constructive community review and comments on environmental restoration activities. Ms. Zeiler stated that the Army is committed to protecting human health and the environment. Ms. Zeiler stated the importance of engaging the community and increasing public participation in the RAB. Ms. Zeiler explained that the RAB is expected to inform the community and hear the concerns. Ms. Zeiler asked if anyone had heard from John Pollard, one of the RAB members, who had not attended a meeting in the past year. Ms. Zeiler stated that she probably needed to send him a letter to find out if he was still interested in being on the board. Ms. Zeiler stated to let her know if anyone knew of someone interested in being on the RAB board also.

Ms. Zeiler stated that Paul Fortune had stepped down as RAB co-chair and the RAB needed to select a new co-chair. Ms. Zeiler then handed out sheets of paper with the names of each of the RAB members. Ms. Zeiler asked the RAB members present to select their 1st and 2nd choices for RAB co-chair and then hand them to Mr. Aaron Williams for tally. Ms. Zeiler explained the role of the new co-chair is speak for the RAB, generally starts the meeting and coordinate opinions from RAB members. Ms. Zeiler stated that concerns or issues by the public or other RAB members (e.g. frequency of RAB meeting) should be brought to the RAB co-chair.

Defense Environmental Restoration

Ms. Kim Nemmers stated that the RAB meeting slides were available along with handouts for the groundwater treatment plant (GWTP) and surface water samples. Ms. Nemmers pointed out that the slide packet contains a map of the installation sites along with a list of abbreviations and acronyms for reference.

LHAAP-50

Mr. Bill Foss presented LHAAP-50 and explained that the site is a small site south of LHAAP-47. Mr. Foss explained the site history for LHAAP-50, including that a remedy has been in place since the Record of Decision (ROD) was signed in 2010. Mr. Foss stated that the remedy has been monitored since that time. Mr. Foss explained that the site had a 47,000 gallon aboveground storage tank that received industrial waste water from sumps throughout LHAAP from the 1950s through the late 1980s. Mr. Foss stated that the constituents of concern were chlorinated solvents and perchlorate in groundwater and perchlorate in soil. Mr. Foss indicated that the remedy selected was monitored natural attenuation (MNA) for the groundwater, excavation of soil contamination that could leach into the groundwater, and land use controls (LUCs). The ROD also had a contingency remedy of enhanced in-situ bioremediation (EISB) if the MNA was not effective.

Mr. Foss explained that MNA was found to be ineffective based upon lines of evidence (in a process developed by the U.S. Environmental Protection Agency [USEPA]) in 2018 following years of groundwater monitoring. Mr. Foss explained that the concentrations of trichloroethylene (TCE) and perchlorate increased from 2013 to 2018. Based upon these increasing concentrations and other lines of evidence, Mr. Foss explained that the Army, Texas Commission on Environmental Quality (TCEQ), and USEPA agreed that the contingency remedy was needed to address the site plumes. Mr. Foss stated that initiation of the contingency remedy was documented in the Explanation of Significant Differences (ESD), which was co-signed by the USEPA and received concurrence from TCEQ.

Mr. Foss explained that, due to the expansion of the plume, an additional well was installed in July 2019. Mr. Foss stated that the groundwater collected from the new monitoring well did not have TCE or perchlorate above the screening levels such that the plume extent is now smaller than previously depicted. Mr. Foss stated that the Remedial Action Work Plan (RAWP) is being prepared to implement the contingency remedy. Mr. Foss stated that the remedy planned is injection of emulsified vegetable oil (EVO) along with microbial culture to enhance the degradation process of TCE and perchlorate. Mr. Foss stated that the goal is to treat the most impacted portions of the plume. Mr. Foss stated that the implementation is planned for later 2019 or early 2020 depending on the time to get the RAWP approved by the USEPA and TCEQ.

Overview of Sites
Ms. Nemmers discussed the field work completed the previous 3 months. She explained that the area had received a large amount of rainfall for an extended period of time and that this has delayed implementation of several remedies until the past 3 months. Ms. Nemmers stated that remedies are being implemented at LHAAP-03, -04, -16, and -17. Ms. Nemmers stated bioremediation approaches, similar to what Mr. Foss presented for LHAAP-50, were being implemented at LHAAP-04 and LHAAP-16. Ms. Nemmers stated that soil excavation was being completed at LHAAP-03 and LHAAP-17. Ms. Nemmers stated that monitoring of the selected remedy has occurred at LHAAP-37, LHAAP-58, and LHAAP-18/24. Ms. Nemmers stated that new monitoring wells were installed at LHAAP-12, -16, -50, and -67 to confirm delineation of the site plumes. Ms. Nemmers stated that the extraction system, installed at LHAAP-18/24, has double-walled piping to transfer the extracted groundwater to the treatment plant. Based upon observed leaks, replacement of portions of this double-walled piping has been completed.

LHAAP-16
For LHAAP-16, Mr. Foss explained the site has perchlorate and TCE impacted groundwater similar to LHAAP-50, which he presented earlier. Mr. Foss then pointed out the location of the site. Mr. Foss explained that the plume emanates from a former landfill towards the bayou. Mr. Foss explained that the site had an extraction system for the plume. When LHAAP lost power in late December 2018, the outage continued into late August 2019 and the extraction system did not operate. Mr. Foss explained that when power was restored in August, the extraction system was operated for a couple of weeks and then the sampling was completed in September 2019 to confirm the October 2018 baseline results. Mr. Foss explained that two monitoring wells were installed on the east side of the Harrison Bayou at the beginning of August 2019. Ms. Zeiler stated that the installation of these wells was difficult and took a long time to get proper conditions for installation. Ms. Zeiler said that these wells were necessary to evaluate the performance of the remedy being implemented and determine if there was TCE across the Bayou in the groundwater.

Mr. Foss stated that injections have started at the site. Mr. Foss explained that the injections started with the Bayou Biobarrier, pointing out the location of this area on slide 13. Mr. Foss also pointed out the two new wells installed on slide 13 (16WW57 and 16WW58). Mr. Foss stated that these wells allow for evaluation of the plume along the downgradient edge. Mr. Foss explained that the area in yellow includes injection of EVO in a grid pattern using direct push technology (DPT) with recirculation to treat this area of elevated perchlorate and TCE. Mr. Foss explained that Biobarriers 1 and 3 have also used DPT for delivery of the EVO. Mr. Foss explained that Biobarrier 2 does not require DPT so the DPT rig has moved over to LHAAP-04. Mr. Richard LeTourneau asked if this site will respond better than others. Mr. Foss stated that everything went in well but the first round of groundwater monitoring, completed after all the injections are done, will help assess the performance. Ms. Laura-Ashley Overdyke asked about the data from the new wells. Mr. Foss stated that the groundwater results from the new wells will be presented in the Remedial Action Completion Report (RACR) that will be produced in 2020. Ms. Zeiler stated that the groundwater results show that the TCE plume crosses the bayou and will be used to evaluate the effectiveness of the injections. Ms. Zeiler stated that surface water sampling will continue and that contamination is not being observed downgradient of the site. Ms. Zeiler pointed out that the field team is checking for injectate in the bayou which could be observed as a white milky material and could take away oxygen in surface water. Ms. Nemmers pointed out that the initial groundwater sampling results may not be representative of whether the site responds well because often it takes a year to observe microbial growth resulting in reduction of the TCE and perchlorate. Ms. Zeiler pointed out that the yellow area, shown on Slide 13 for LHAAP-16, is where the extraction system was located, which is now turned off, and that the area is a treatment area and not a barrier. High concentrations of TCE are found in the area in both the shallow and intermediate zone groundwater. Ms. Zeiler explained that a grid of injections is used in the shallow zone of the ISB treatment area to treat the contamination and existing extraction wells are used in the intermediate zone to recirculate injectate to get as much contact as possible with the TCE contamination in that zone. Ms. Zeiler pointed out that with the landfill being the source of the plume, additional injections will likely be needed in the future along the landfill biobarriers.

LHAAP-17

Mr. Foss explained that LHAAP-17 is located across the Bayou and southeast of LHAAP-16. Mr. Foss stated that LHAAP-17 was a burning ground and flashing site. Mr. Foss explained that the site was excavated beginning in August 2019 for explosives in the soil and that approximately 5,300 cubic yards of soil was expected to be removed. However, munition items were found during the excavation, which was unanticipated. The Army provided Ordnance and Explosives Safety Specialist (OESS) support. Mr. Foss stated that the initial rounds found were not live so the excavation continued under OESS supervision. Mr. Foss stated that the excavation was nearly completed but then additional munitions debris and munitions and explosives of concern (MEC) were found. Therefore, work has been stopped to be able to provide additional ordnance support and ensure safety of intrusive activities. Mr. Foss explained that as a safety measure the currently excavated areas will be backfilled in early November 2019.

Mr. Foss explained that the second part of the remedy involves the installation of a groundwater extraction system to treat perchlorate in groundwater. Mr. Foss stated that placement of that system will be above ground to avoid intrusive activities. Mr. Foss explained that this will allow the remedy to move forward. Ms. Judy VanDeventer asked if the remaining excavation will be done under this contract. Ms. Zeiler stated that the work will be under a separate contract. Mr. Foss stated that a report will be prepared to document the excavation and backfilling work completed at the site to date to support the scoping of follow-on excavation work. Ms. Nemmers pointed out that the dashed lines on slide 16 show the extent of the excavation. Ms. Nemmers stated that over excavation was necessary for some sidewalls as shown by dashed lines that move away from the planned excavation and that most of the planned excavation was completed.

Look Ahead

Ms. Nemmers then discussed the 3 month look ahead for LHAAP field work. Ms. Nemmers stated that the documents in the coming months include annual Remedial Action Operations [RA(O)]

Reports that document the progress of the remedies implemented. Ms. Nemmers stated that the RAWP for the injections at LHAAP-50 is going through the review process as previously discussed. Ms. Nemmers stated that the quarterly evaluation reports for the GWTP are in process for the second and third quarter of 2019.

Ms. Nemmers stated that the field work look ahead includes the four sites discussed throughout the meeting. Ms. Nemmers stated that LHAAP-03 is a small site with arsenic and lead in the soil that requires a little additional excavation based upon the soil sample results and then backfilling. Ms. Nemmers stated that LHAAP-17 field work will hopefully include installation of the extraction system in addition to backfilling the excavation. Ms. Nemmers stated that the injections will be completed at LHAAP-04 and LHAAP-16 in the coming weeks and then the sites will enter the performance monitoring phase. Ms. Nemmers stated that the other sites listed on slide 18 are the sites with remedies in place that have on-going RA(O) sampling. Ms. Zeiler reminded everyone that the field schedules are posted on the website and encouraged everyone to check for this information. Ms. Nemmers pointed out that the look ahead for documents is the same list that are currently being completed because the documents take time to get reviewed and approved. Ms. Zeiler pointed out that the Contingency RAWP is the document for the injection field work at LHAAP-50, discussed early on in the meeting.

Groundwater Treatment Plant

Ms. Nemmers stated that there were handouts with the information on the slides for the GWTP that provide more details. Ms. Nemmers pointed out that the chart depicts discharge of treated water that includes water from the INF Pond so the peaks and valleys of the chart indicate discharge to the Bayou from both the GWTP and the INF Pond if able. Ms. Nemmers explained that when the Bayou is not flowing that the treated groundwater is discharged to the INF Pond. Ms. Nemmers also stated that more water can be extracted from the ground when there is more precipitation. Mr. Charles Dixon asked if the purpose of discharging in this way was to keep the minerals low. Ms. Zeiler stated that chloride and sulfate is tested prior to discharge to the Bayou.

Surface Water Sampling

Ms. Nemmers presented the five locations sampled for surface water. Ms. Nemmers stated that surface water samples are collected on a quarterly basis when the Bayou is flowing. Ms. Nemmers explained that one of the surface water samples exceeded the screening criteria of 17 parts per billion (ppb) for perchlorate. Ms. Nemmers stated that the surface water location was resampled a couple of weeks later. Ms. Nemmers stated that the result from the resample was 1.2 J ppb, with J meaning that the result was estimated. Ms. Nemmers explained that the detection limit is typically 2 ppb and so the detection was seen by the laboratory but below the detection limit. Ms. Nemmers stated that the location of the surface water sample was the furthest downgradient sample location but has historically had detections of perchlorate. Ms. Nemmers stated that LHAAP-18/24 was sampled in this same time period and that monitoring wells upgradient of this surface water sample did not have detections of perchlorate. Ms. Nemmers stated that the surface water will be sampled in the fourth quarter but has not been sampled in October 2019 to date due to lack of surface water flow. Ms. Zeiler pointed out that the screening criteria is the groundwater drinking level. Ms. Nemmers stated that this information is also provided in a handout.

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

Mr. Williams explained that HDR, Inc., has a separate contract for sites that do not have a ROD and is responsible for selection of the final remedy at three sites (LHAAP-18/24, LHAAP-29, and LHAAP-47). Mr. Williams explained that the LHAAP-18/24 ROD is being reviewed by the regulators and that comments are expected later in October 2019. Mr. Williams hoped that the ROD could be signed in late 2019.

Mr. Williams stated that the Final ROD for LHAAP-29 was signed and is on compact disc (CD) at the Marshall Public Library. On October 13, 2019, Mr. Williams stated that the notice that the final ROD was available for review was put into the Marshall News Messenger and the Shreveport Times.

Mr. Williams stated that LHAAP-47 had old data so additional data was obtained. A new well installed had an elevated detection of TCE such that the remedy selected would not be effective at those high levels. Currently, Work Plan Addendum 2 is being completed. The additional investigation planned will focus on the area around monitoring well 47MW25R. Monitoring well 47MW25R had TCE detected at 120,000 ppb. Mr. Williams explained the field work planned included both soil and groundwater samples.

Ms. Overdyke asked if LHAAP-17 excavation could have contributed to the perchlorate detected in HBW-7. Ms. Zeiler stated that the excavation commenced after the surface water sampling was completed. Ms. Zeiler stated that groundwater results and water levels were evaluated but no reason for the detection could be identified. Ms. Zeiler pointed out that implementation of the remedies such as at LHAAP-18/24 makes the Army feel better about the overall progress at this site.

Next RAB Meeting Schedule and Closing Remarks

Ms. Zeiler then discussed the next meeting with the RAB members. It was decided that the next RAB Meeting will be held on **January 16, 2020,** with the **meeting starting at 6:00 pm Central Standard Time (CST)** at the Karnack Community Center.

Ms. Zeiler announced that Ms. VanDeventer was selected as the new co-chair. Ms. VanDeventer accepted the position. Mr. Kent Becher mentioned that Mr. Rich Mayer was retiring. Mr. Mayer said that he had been at the USEPA since January 1987 and will be retiring on December 31, 2019. Mr. Mayer stated that he's been with the EPA since January 1987. Mr. Mayer said that he had been reviewing documents, like those for LHAAP, for 33 years. Mr. Mayer said that he'd enjoyed working with the RAB and that a replacement had not yet been selected for him by the EPA.

Adjourn

Ms. VanDeventer made the motion to adjourn and Mr. Dixon seconded the motion. The meeting adjourned at 6:55 pm CDT.

October 2019 Meeting Attachments and Handouts:

- Color Copy of Bhate Presentation Slides
- GWTP – Processed Groundwater Volumes Handout
- Surface Water Sampling Handout

Longhorn Army Ammunition Plant Quarterly Restoration Advisory Board Meeting

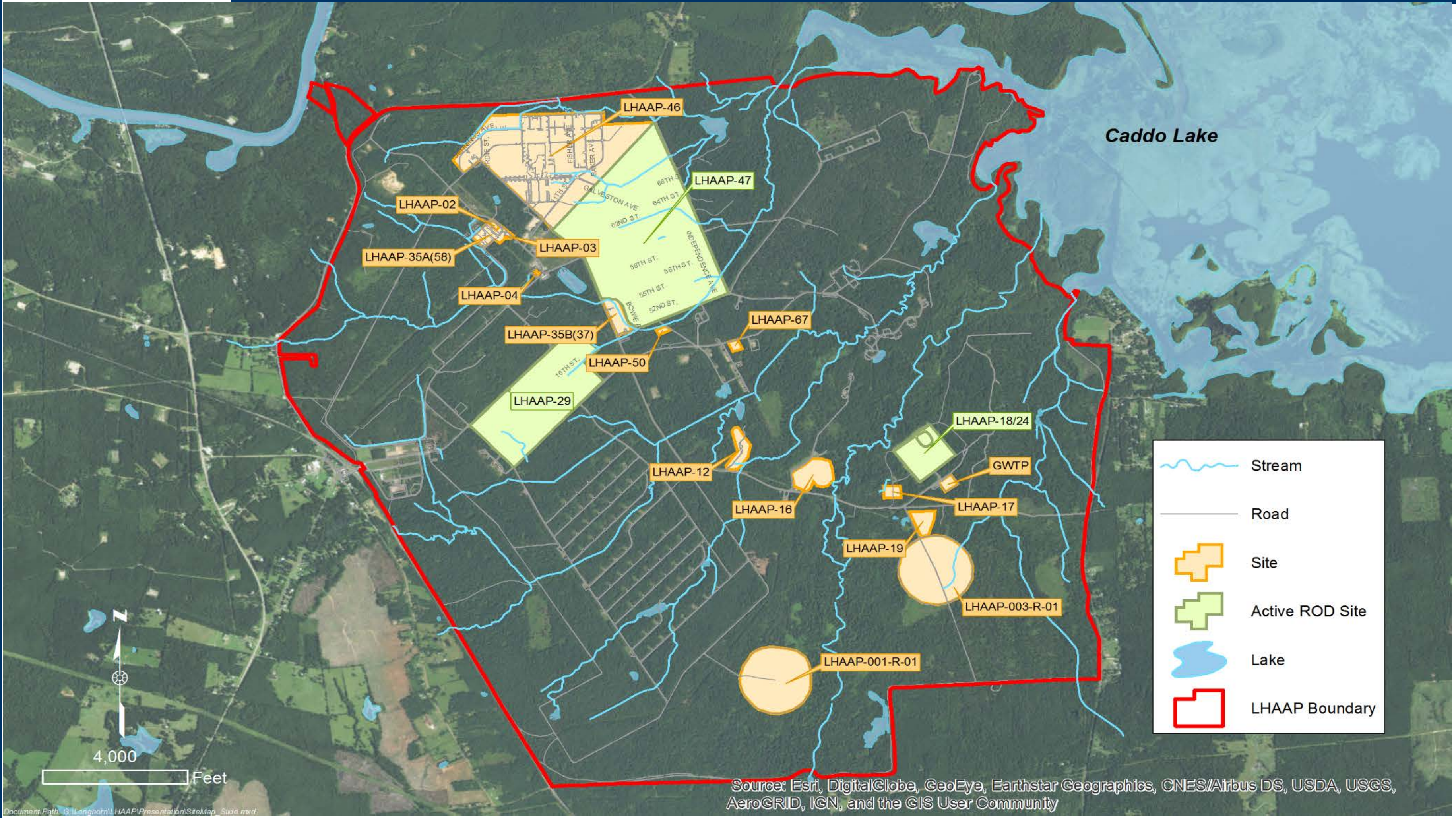
Karnack Community Center
October 23, 2019
6:00 PM CDT

APTIM

bhate

Restoration Advisory Board Meeting

Site Map



Abbreviations and Acronyms

µg/L	Micrograms per liter
DERP	Defense Environmental Restoration Program
DPT	Direct Push Technology
ESD	Explanation of Significant Differences
GPW	Goose Prairie Creek Water Sample
GW-Res	Residential Groundwater
GWTP	Groundwater Treatment Plant
HBW	Harrison Bayou Water Sample
ISB	In-situ bioremediation
LHAAP	Longhorn Army Ammunition Plant
MEC	Munitions and Explosives of Concern

MNA	Monitored natural attenuation
PCL	Protective Concentration Level
PSI	Pre-Screening Investigation
RAB	Restoration Advisory Board
RA(O)	Remedial Action Operation
RAWP	Remedial Action Work Plan
ROD	Record of Decision
TCE	Trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TRRP	Texas Risk Reduction Program
USEPA	U.S. Environmental Protection Agency

Restoration Advisory Board Meeting

Agenda

06:00	Welcome and Introduction
06:05	Open Items
	Purpose of the Restoration Advisory Board (RAB) Meeting
	Ongoing Outreach/Website
	RAB Administrative Issues
	- Membership Update
	- Minutes (July 2019 RAB Meeting)
	- Election of new Co-Chair
06:15	Defense Environmental Restoration Program (DERP) Update
	LHAAP-50 Remedial Action Work Plan (RAWP)
	Documents and Field Work Completed Since Last RAB
	- LHAAP-16
	- LHAAP-17
	3 Month Look Ahead
	Groundwater Treatment Plant (GWTP) Update
06:45	Other DERP Update
	LHAAP-18/24 Record of Decision (ROD) and Responsiveness Summary
	- LHAAP-29 ROD and Responsiveness Summary
	- LHAAP-47 Additional Pre-Screening Investigation (PSI) Data & Revised ROD Schedule
	- Five Year Review Update – Recommendations for Sites 12, 50, and 67
06:55	Next RAB Meeting Schedule and Closing Remarks {RMZ}

Purpose of the RAB Meeting

- **Held every 3 months**
- **The mission of the Longhorn Army Ammunition Plant (LHAAP) RAB is to promote community awareness and obtain constructive community review and comments on environmental restoration activities at the former LHAAP**

The Army Wants You to be Informed

- The Army is committed to protecting human health and the environment; key to that commitment is engaging the community and increasing public participation in environmental restoration at LHAAP
- You are encouraged to:
  - Attend RAB Meetings and/or become a member of the RAB
  - Visit the Longhorn environmental website at www.longhornaap.com
    - Website is regularly updated to indicate the upcoming field events at each site including groundwater sampling, monitoring well installations, soil sampling, or remediation activities
  - Make suggestions for improving communication – the Army welcomes and appreciates community feedback

RAB Administrative Issues

- **Membership Update**
- **Minutes (July 2019 RAB Meeting)**
- **Election of new Co-Chair**

Restoration Advisory Board Meeting

LHAAP-50 Contingency RAWP

- Site Background
  - LHAAP-50 had a 47,000-gallon aboveground storage tank receiving industrial wastewater from various production sumps throughout LHAAP between 1955 and 1988.
  - After solids were filtered, the water was discharged to Goose Prairie Creek.
  - Constituents of concern at LHAAP-50 were chlorinated solvents and perchlorate in groundwater and perchlorate in soil.
  - The selected remedy in the 2010 ROD was monitored natural attenuation (MNA), excavation of soil to eliminate groundwater contamination from contaminated soil, and land use controls as the remedy for groundwater. The ROD also included a contingency remedy for groundwater if MNA was not effective.

Restoration Advisory Board Meeting

LHAAP-50 Contingency RAWP

- Site Background-Continued
  - In 2018, MNA was found to be ineffective based on evaluation of several lines of evidence.
  - Concentrations of trichloroethylene (TCE) and perchlorate increased from 2013 to 2018, and the TCE plume has expanded beyond its baseline footprint.
  - Final Explanation of Significant Differences (ESD) to the ROD for a contingency remedy was published in July 2019 and co-signed by the U.S. Environmental Protection Agency (USEPA) and Army and concurred by Texas Commission on Environmental Quality (TCEQ) in August 2019.
  - In July 2019, one additional monitoring well (50WW29) was installed and sampled.
  - Sample results confirmed the extent of the TCE and perchlorate plumes in groundwater.

LHAAP-50 Contingency RAWP Continued

Contingency RAWP

- RAWP is still in development and will undergo USEPA and TCEQ review and concurrence before implementation.
- The RAWP will include injection of emulsified vegetable oil, a microbial culture (SDC-9™), and nutrients to enhance biological degradation of perchlorate and TCE hot spots.
- Monitoring of the contingency remedy will include quarterly performance monitoring of selected wells for 2 years, as well as continued long-term monitoring of the larger plume area.
- Implementation of the Contingency RAWP is anticipated in late 2019.

Completed Field Work Since Last RAB Meeting

Site	Activity
LHAAP-03	Implementation of Remedial Action (Soil Excavation)
LHAAP-04	Implementation of Remedial Action (In-situ bioremediation [ISB] Injections)
LHAAP-16	Implementation of Remedial Action (ISB Injections)
LHAAP-17	Implementation of Remedial Action (Soil Excavation)
LHAAP-37	Remedial Action Operation [RA(O)] Sampling – August 2019
LHAAP-46	RA(O) Sampling – August 2019
LHAAP-58	RA(O) Sampling of Western Plume – September 2019
LHAAP-18/24	RA(O) Sampling – Maintenance/repairs
LHAAP-12/16/50/67	Installation of New Monitoring Wells

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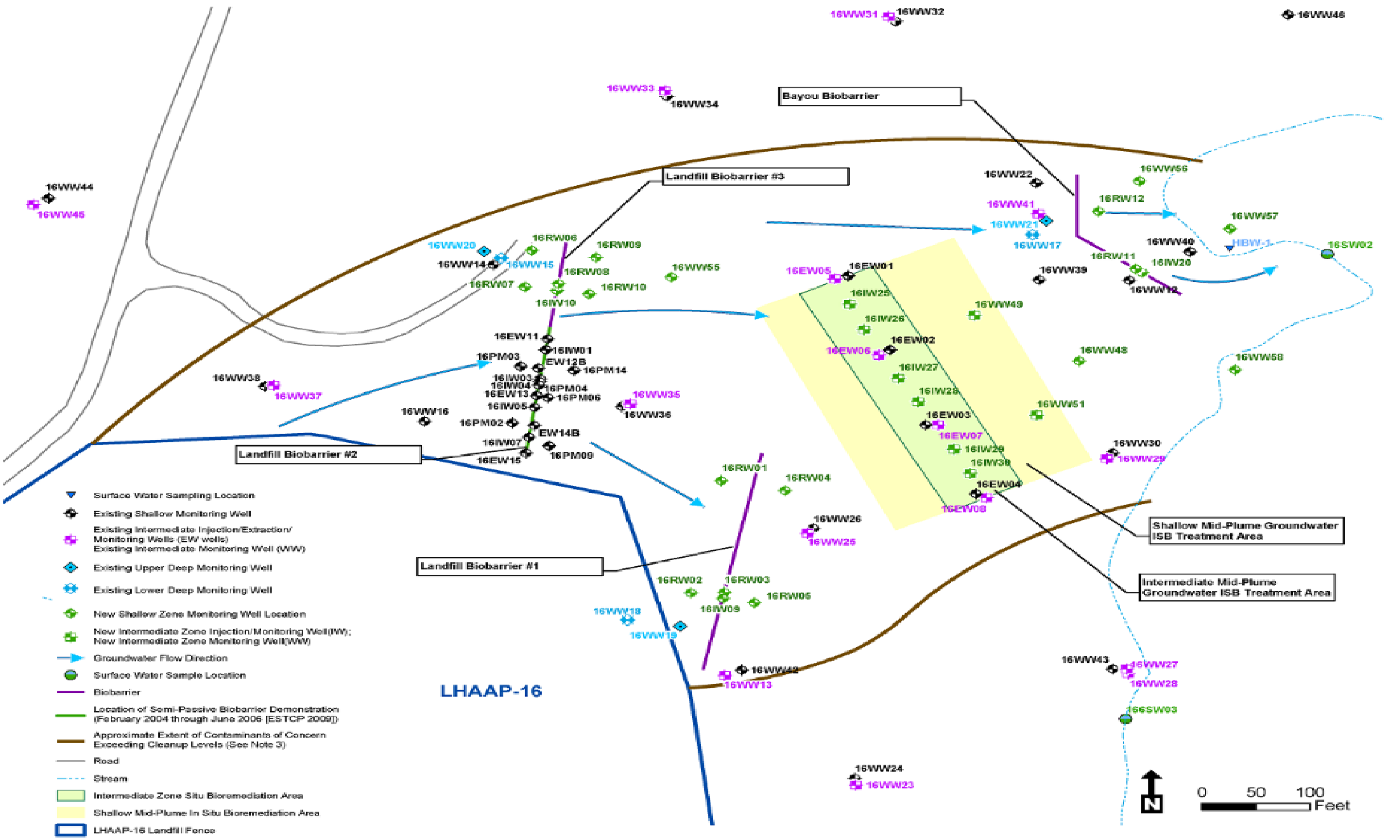
LHAAP-16 Remedial Action Update

- Power restored to site in late August 2019 and extraction system restarted.
- Two wells on east side of Harrison Bayou (16WW57 & 16WW58) and one remaining intermediate zone well (16WW49) installed in July/August 2019
- Baseline samples collected from selected wells in September 2019 to complement October 2018 Baseline Sampling
- Injections completed in the Bayou Biobarrier, Mid-Plume Area, Biobarrier #1, Biobarrier #2, and Biobarrier #3
- 80,874 gallons of ISB solution injected starting on September 24, 2019 with 102 injection locations

Restoration Advisory Board Meeting

LHAAP-16 Remedial Action Update



Restoration Advisory Board Meeting

LHAAP-17 Remedial Action Update

- Excavation of contaminated soil initiated on August 21, 2019
- During excavation, unanticipated munitions items were discovered and addressed by Army Explosive Ordnance Disposal teams
- Excavation continued with support from an Army Ordnance and Explosives Safety Specialist
- Approximately 6,000 cubic yards of soil was excavated between August 21 and September 28, 2019

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action Update

- On September 28, additional munitions debris and potential munitions and explosives of concern (MEC)were discovered and excavation work was halted for further site evaluation
  - At Army direction, excavation work has ceased and open areas will be backfilled and no intrusive activities will be performed at the site.
  - Remaining excavation work will need to be completed under a separate contract that includes munitions response support.
- Existing excavation areas will be backfilled as a safety measure
- Options for constructing the LHAAP-17 groundwater extraction system without requiring intrusive activities are currently being considered

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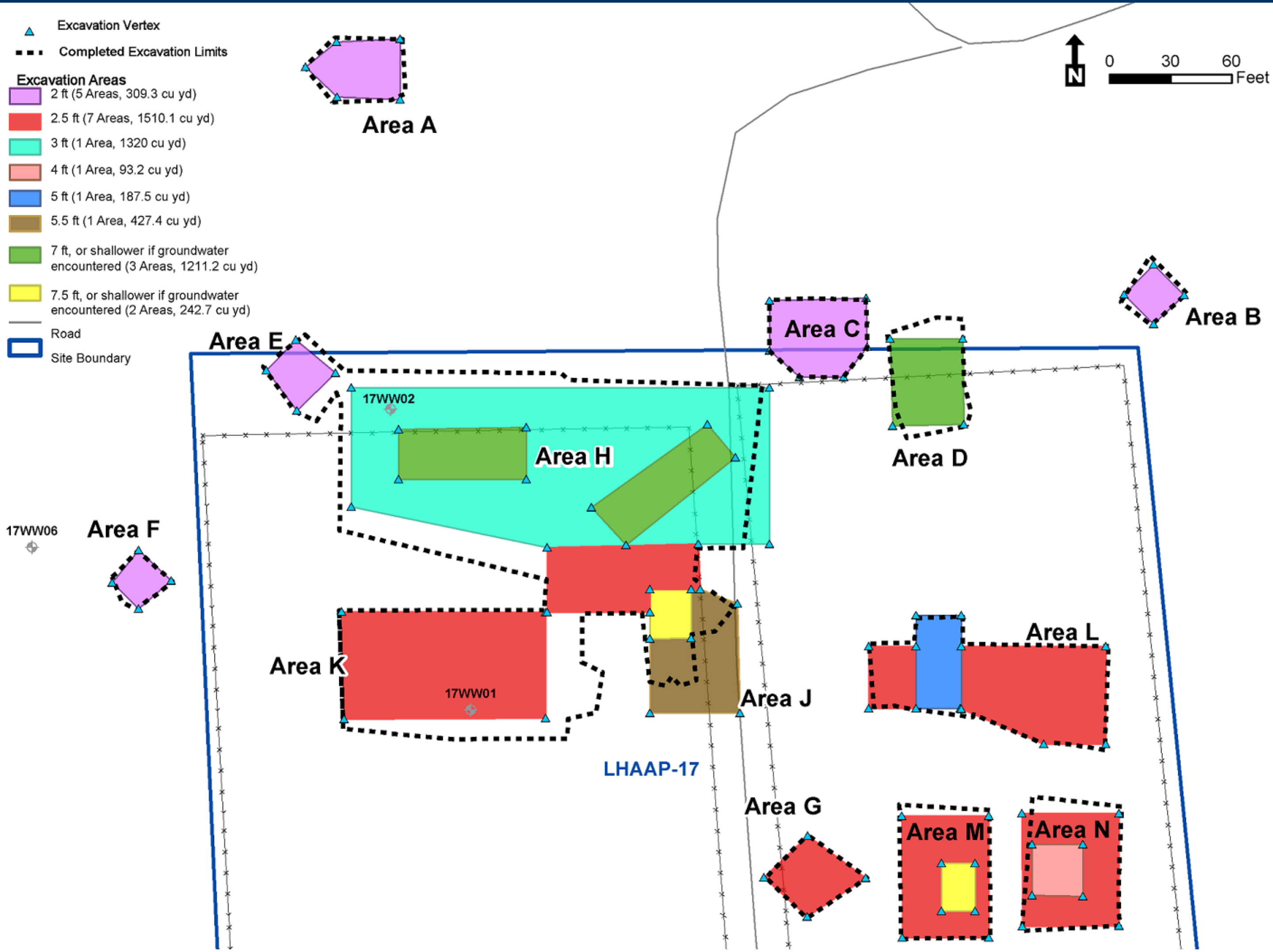
Restoration Advisory Board Meeting

LHAAP-17 Remedial Action Update



Documents in Process

Site	Document
LHAAP-46	Annual RA(O) Report
LHAAP-50	Contingency RAWP
LHAAP-58	Annual RA(O) Report
LHAAP-67	Annual RA(O) Report
GWTP	Quarterly Evaluation Report: Second Quarter (April – June 2019) Quarterly Evaluation Report: Third Quarter (July – September 2019)

Restoration Advisory Board Meeting

3 Month Look Ahead - Field Work by Bhate Team

Site	Activity
LHAAP-03	Complete excavation backfill
LHAAP-04	Performance monitoring
LHAAP-16	Performance monitoring
LHAAP-17	Complete excavation backfill and extraction system installation
LHAAP-37	RA(O) Sampling – November 2019
LHAAP-50	RA(O) Sampling – November 2019
LHAAP-58	RA(O) Sampling – December 2019
LHAAP-67	RA(O) Sampling – November 2019
LHAAP-18/24	RA(O) Sampling – December 2019

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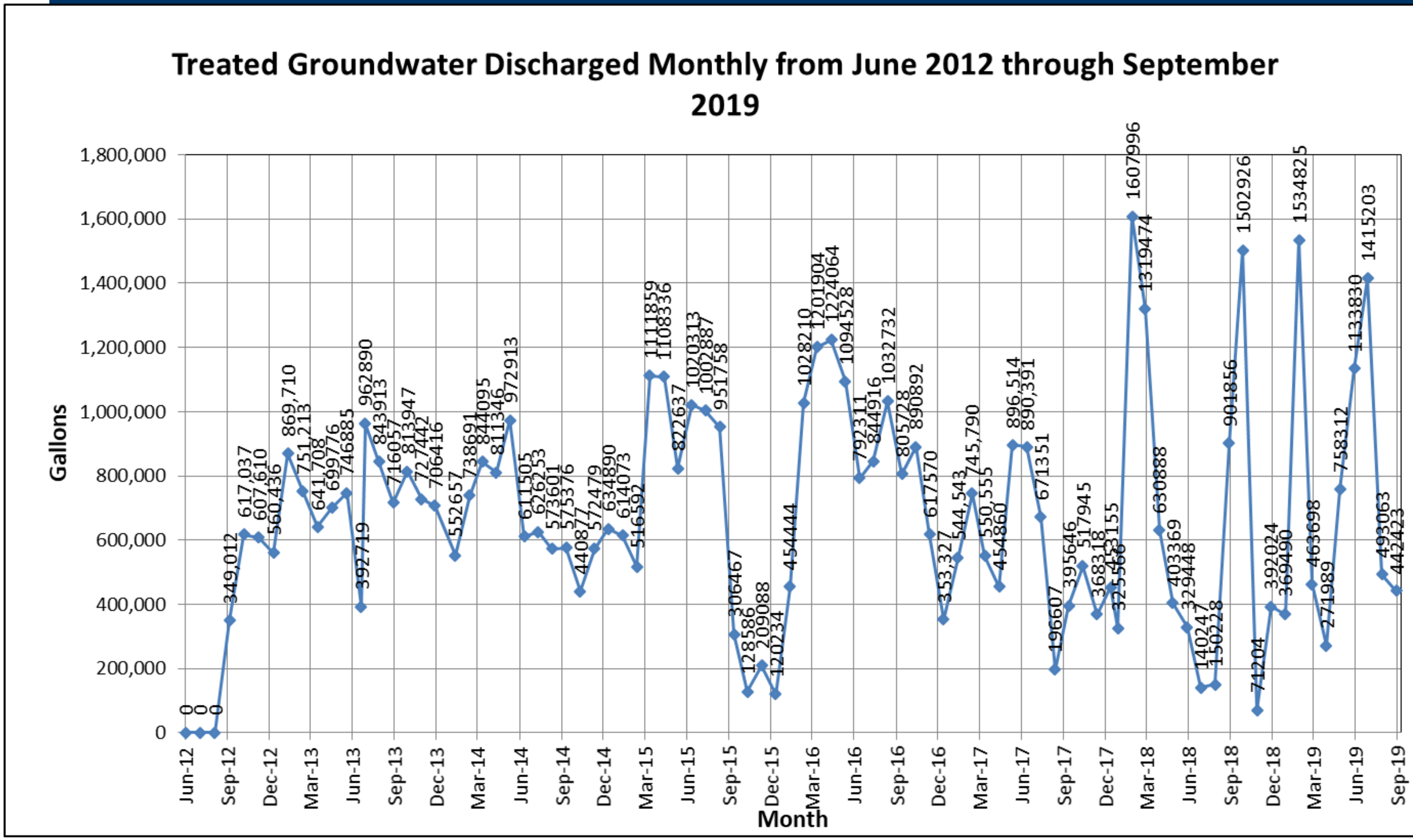
3 Month Look Ahead – Documents by Bhate Team

Site	Document
LHAAP-50	Finalize the Contingency RAWP
LHAAP-58	Finalize the Year 5 RA(O) Report
GWTP, LHAAP-16, and LHAAP-18/24	Quarterly Evaluation Report: Second Quarter (April –June 2019) Quarterly Evaluation Report: Third Quarter (July –September 2019)

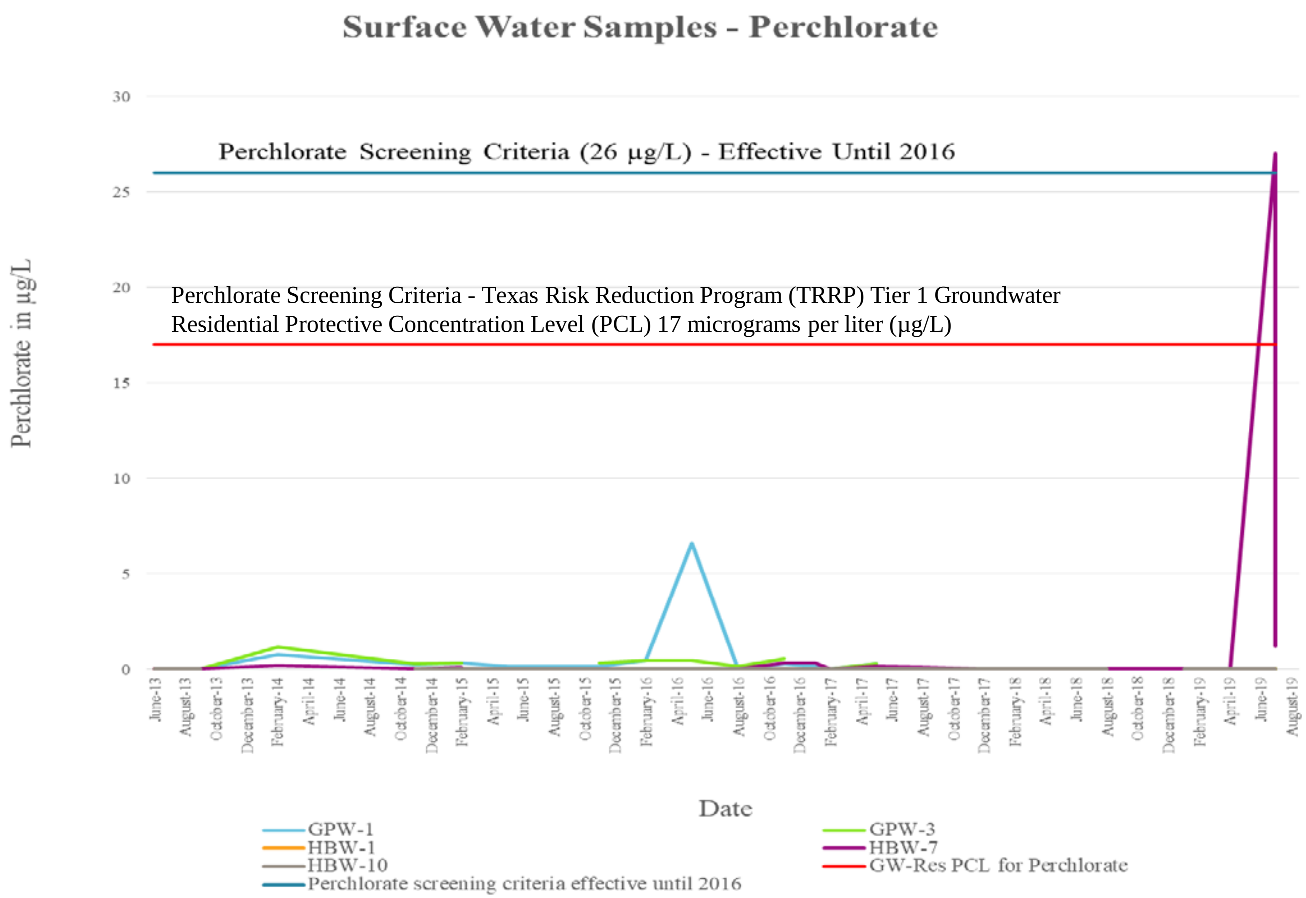
Restoration Advisory Board Meeting

GWTP Update



Restoration Advisory Board Meeting

Surface Water Sample Results



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

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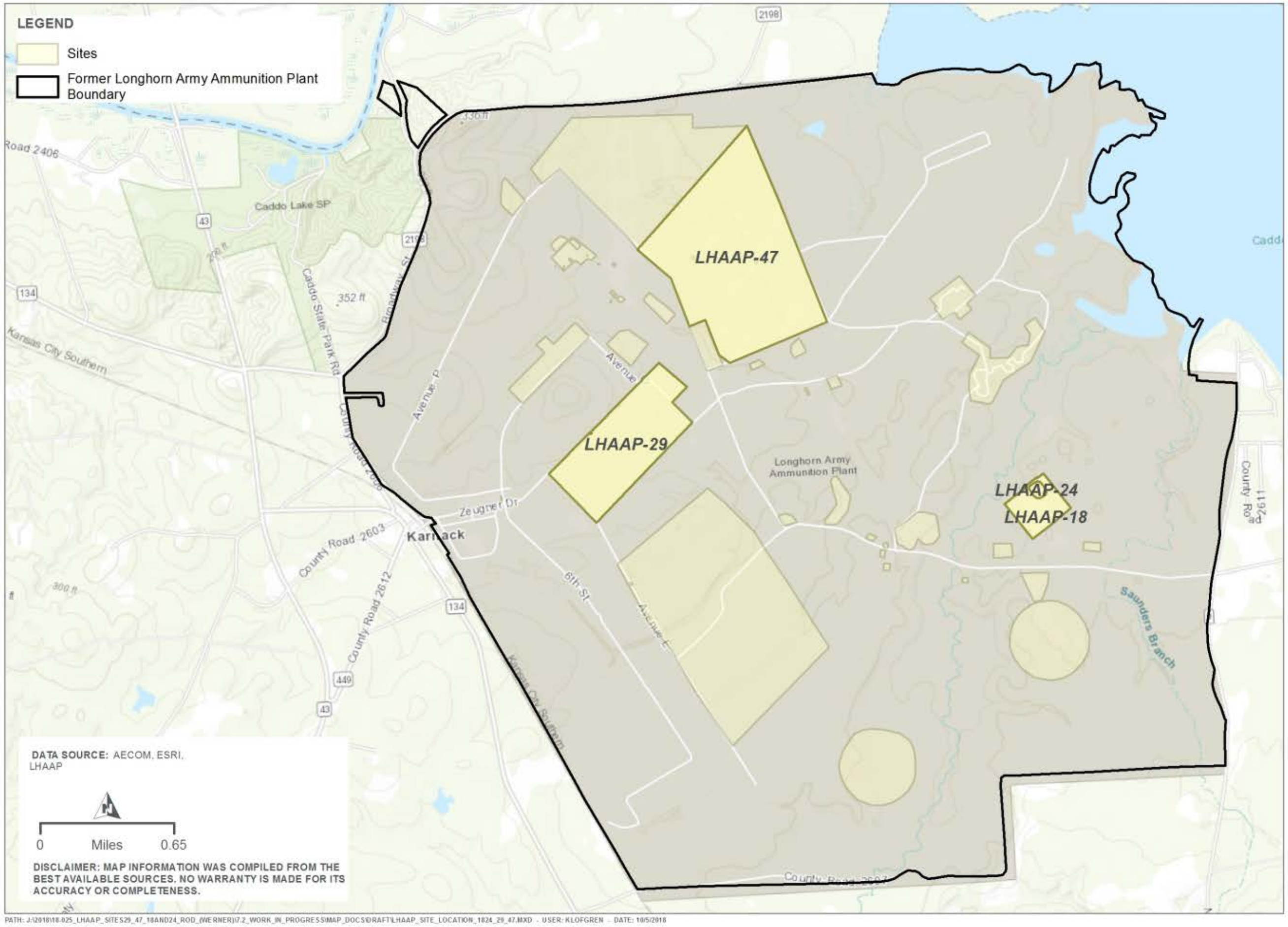
LHAAP-18/24, 29, 47 Status Update



LHAAP-18/24 & 29 Document Status

- **LHAAP-18/24**
  - **Draft Record of Decision submitted to the Regulators September 6, 2019**
- **LHAAP-29**
  - **Final Record of Decision signed September 19, 2019**
  - **Notice of Availability published in the Marshall News Messenger and Shreveport Times on October 13, 2019 and October 9, 2019 respectively. The ROD is available for public review at the Marshall Public Library.**
- **LHAAP-47**
  - **Draft PSI Work Plan Addendum No. 2 in Regulator review- Fieldwork to support the Record of Decision anticipated in early November 2019.**

LHAAP-47 Field Work Plan

- Work Planned
  - 11 Direct Push Technology (DPT) borings
  - 33 soil samples and 11 groundwater samples collected from DPT borings to identify source and extent
  - Collect groundwater samples from 3 existing wells for confirmation of results

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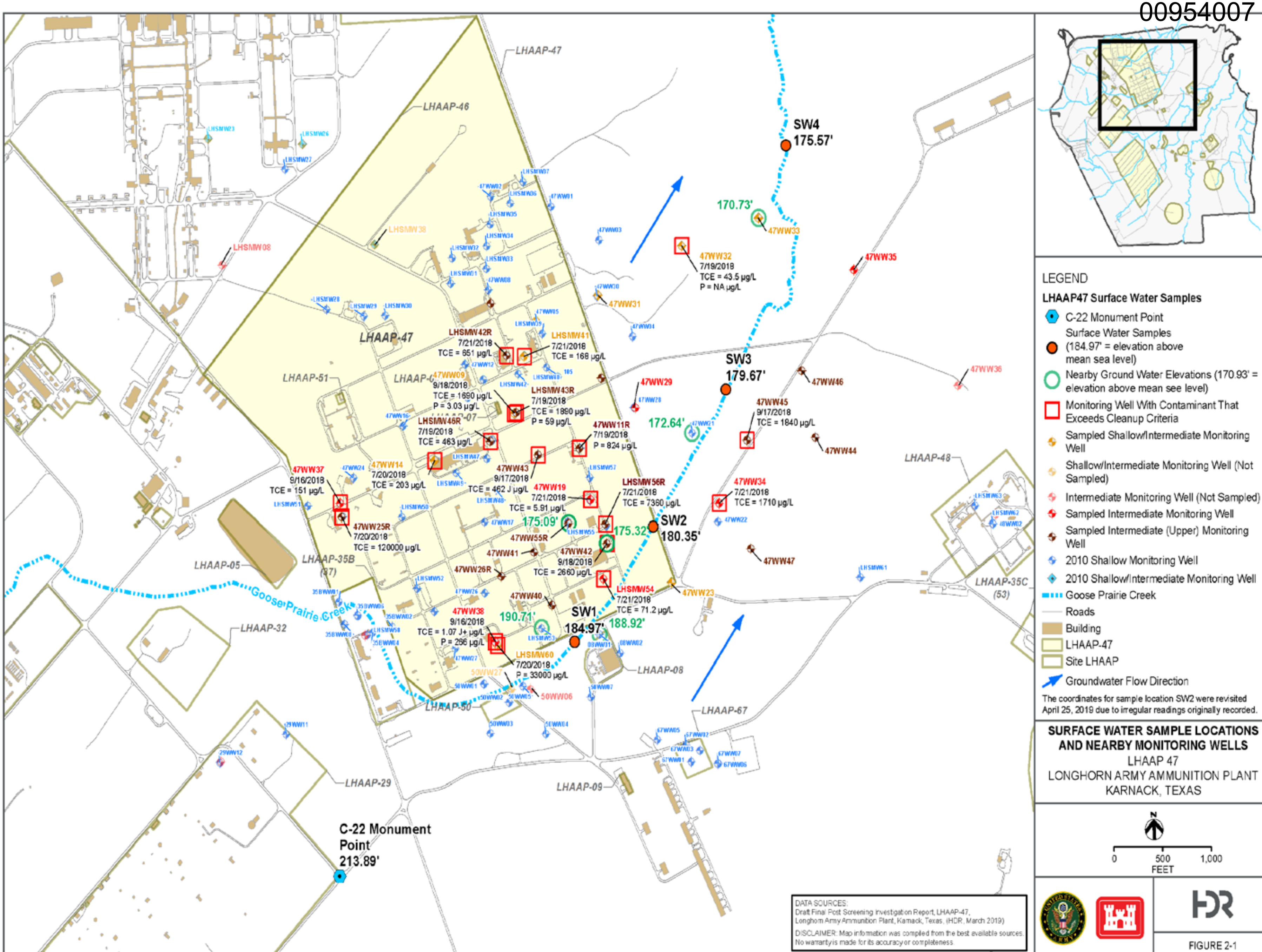
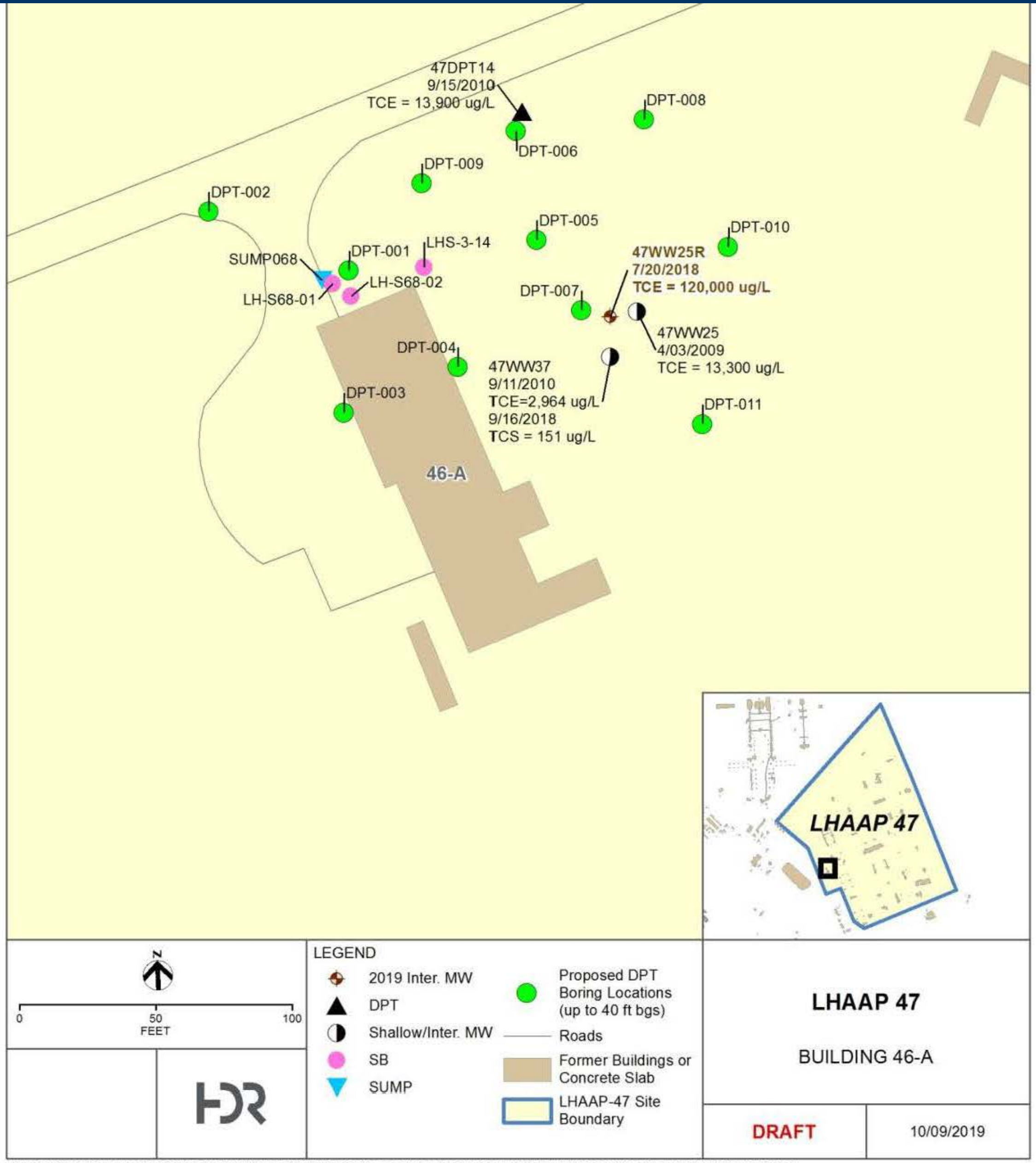


LHAAP-47
LHAAP-46
LHAAP-51
LHAAP-05
LHAAP-35B (37)
LHAAP-32
LHAAP-29
LHAAP-50
LHAAP-09
LHAAP-67
LHAAP-08
LHAAP-48
LHAAP-35C (53)
Goose Prairie Creek
SW4 175.57'
SW3 179.67'
SW2 180.35'
SW1 184.97'
170.73'
172.64'
175.09'
175.32'
190.71'
188.92'
C-22 Monument Point 213.89'
47WW32 7/19/2018 TCE = 43.5 µg/L P = NA µg/L
47WW33
47WW35
47WW31
47WW29
47WW46
47WW36
47WW45 9/17/2018 TCE = 1840 µg/L
47WW44
47WW34 7/21/2018 TCE = 1710 µg/L
47WW47
47WW23
LHSMW42R 7/21/2018 TCE = 651 µg/L
LHSMW41 7/21/2018 TCE = 168 µg/L
47WW09 9/18/2018 TCE = 1690 µg/L P = 3.03 µg/L
LHSMW43R 7/19/2018 TCE = 1890 µg/L P = 59 µg/L
LHSMW46R 7/19/2018 TCE = 463 µg/L
47WW11R 7/19/2018 P = 824 µg/L
47WW37 9/16/2018 TCE = 151 µg/L
47WW14 7/20/2018 TCE = 203 µg/L
47WW43 9/17/2018 TCE = 462 J µg/L
47WW19 7/21/2018 TCE = 5.91 µg/L
LHSMW56R 7/21/2018 TCE = 7360 µg/L
47WW25R 7/20/2018 TCE = 120000 µg/L
47WW55R
47WW41
47WW42 9/18/2018 TCE = 2660 µg/L
47WW26R
47WW40
LHSMW54 7/21/2018 TCE = 71.2 µg/L
47WW38 9/16/2018 TCE = 1.07 J+ µg/L P = 266 µg/L
LHSMW60 7/20/2018 P = 33000 µg/L
LHSMW38
LHSMW08
50WW06
LEGEND
LHAAP47 Surface Water Samples
C-22 Monument Point
Surface Water Samples (184.97' = elevation above mean sea level)
Nearby Ground Water Elevations (170.93' = elevation above mean see level)
Monitoring Well With Contaminant That Exceeds Cleanup Criteria
Sampled Shallow/Intermediate Monitoring Well
Shallow/Intermediate Monitoring Well (Not Sampled)
Intermediate Monitoring Well (Not Sampled)
Sampled Intermediate Monitoring Well
Sampled Intermediate (Upper) Monitoring Well
2010 Shallow Monitoring Well
2010 Shallow/Intermediate Monitoring Well
Goose Prairie Creek
Roads
Building
LHAAP-47
Site LHAAP
Groundwater Flow Direction
The coordinates for sample location SW2 were revisited April 25, 2019 due to irregular readings originally recorded.
SURFACE WATER SAMPLE LOCATIONS AND NEARBY MONITORING WELLS
LHAAP 47
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
N
0 500 1,000
FEET
DATA SOURCES:
Draft Final Post Screening Investigation Report, LHAAP-47, Longhorn Army Ammunition Plant, Karnack, Texas. (HDR, March 2019)
DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.
HDR
FIGURE 2-1

LHAAP-47 Field Work Plan



Next RAB Meeting Schedule & Closing Remarks

- Schedule January 2020 RAB Meeting
- Other Issues/Remarks
- Thank you for coming

Groundwater Treatment Plant - Processed Groundwater Volumes

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

Processed Water Discharged Data

(in gallons)

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

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

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

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

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

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

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

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

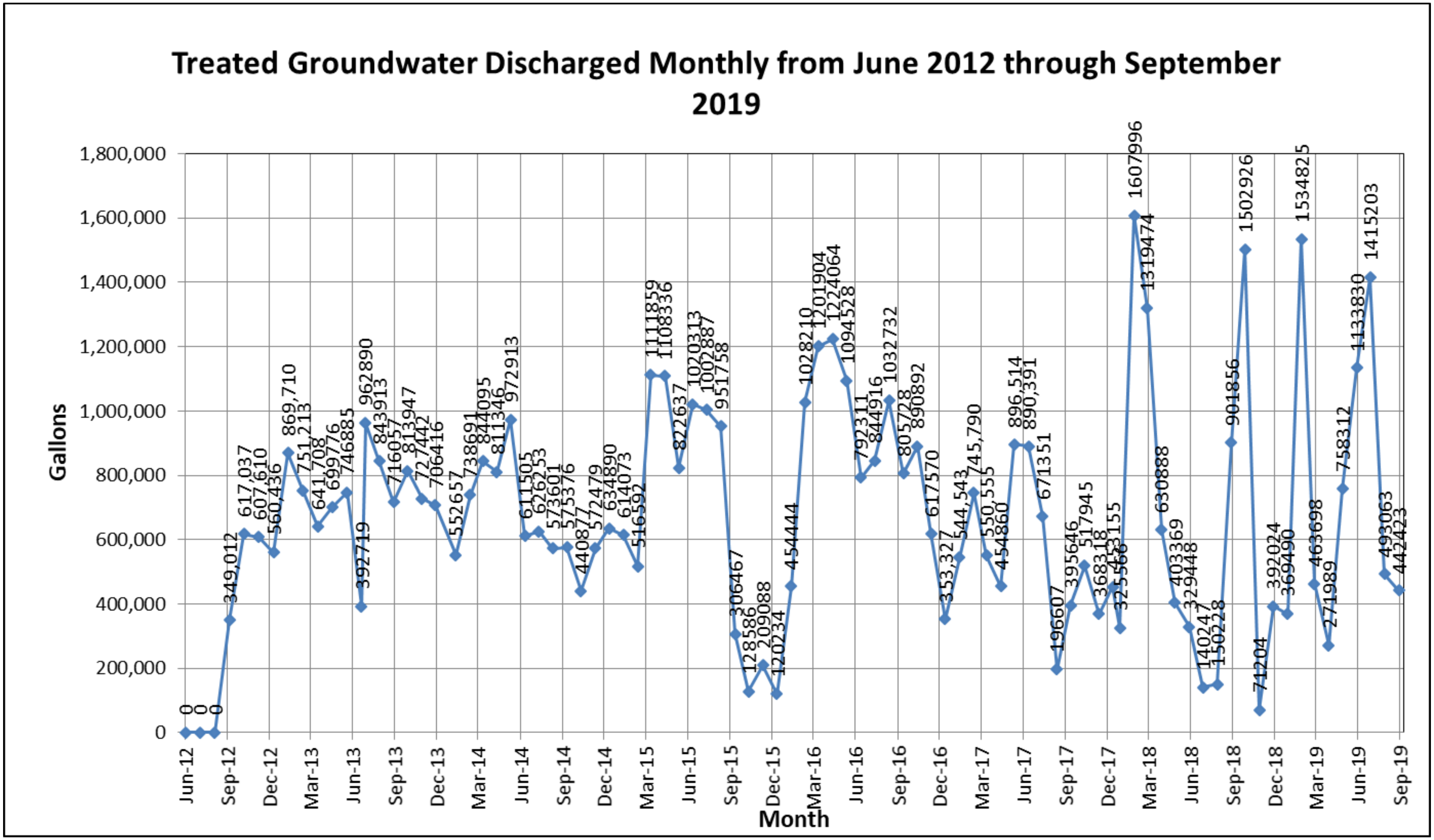
Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
128,586	209,088	120,234	454,444	1,028,210	1,201,904	1,224,064	1,094,528	792,311	844,916	1,032,732	805,728

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

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

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

*Indicates Estimate


Treated Groundwater Discharged Monthly from June 2012 through September 2019
Gallons
Month
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jun-12
Sep-12
Dec-12
Mar-13
Jun-13
Sep-13
Dec-13
Mar-14
Jun-14
Sep-14
Dec-14
Mar-15
Jun-15
Sep-15
Dec-15
Mar-16
Jun-16
Sep-16
Dec-16
Mar-17
Jun-17
Sep-17
Dec-17
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
0
0
0
349,012
617,037
607,610
560,436
869,710
751,213
641,708
699776
746885
392719
962890
843913
813947
706416
738691
972913
611505
573601
573376
634890
614073
516592
1111859
1108336
822637
1020313
951758
306467
128586
209088
120234
454444
1028210
1201904
1224064
1094528
792311
844916
1032732
890892
617570
544,543
745,790
550,555
454860
896,514
890,391
671351
196607
395646
517945
1607996
1319474
630888
403369
329448
150228
901856
1502926
71204
392024
369490
1534825
463698
271989
758312
1133830
1415203
493063
442423

Water Discharge Location and Volume (Gallons)

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Dec-16	0	236,688	0	0	0
Jan-17	0	0	0	0	0
Feb-17	0	0	0	0	14,355
Mar-17	127,242	0	0	0	14,400
Apr-17	113,038	0	236,821	0	0
May-17	0	0	534,155	0	0
Jun-17	958,404	0	294,550	490,574	0
Jul-17	0	0	528,538	0	0
Aug-17	0	0	195,197	0	0
Sep-17	651,434	0	309,980	651,434	0
Oct-17	0	0	517,945	0	0
Nov-17	0	0	368,318	0	0
Dec-17	560,350	0	453,155	560,350	0
Jan-18	325,566	0	253,177	325,566	0
Feb-18	1,607,996	0	62,017	1,430,634	0
Mar-18	1,319,474	0	0	870,816	0
Apr-18	630,888	0	0	630,888	0
May-18	403,369	0	0	403,369	0
Jun-18	193,669	0	135,779	0	0
Jul -18	0	0	140,247	0	0
Aug -18	49,409	0	100,819	0	0
Sep-18	585,397	0	316,459	524,484	0
Oct-18	1,409,106	0	93,820	1,016,285	0
Nov-18	71,204	0	0	0	0
Dec-18	392,024	0	0	0	0
Jan-19	369,490	0	0	369,490	0
Feb-19	1,534,825	0	0	1,326,485	0
Mar-19	463,698	0	0	83,250	0
Apr-19	271,989	0	0	0	0
May-19	758,312	0	0	253,817	0

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Jun-19	1,133,830	0	0	847,918	0
Jul -19	1,415,203	0	0	903,001	0
Aug-19	374,629	0	118,434	0	0
Sep-19	0	0	442,423	0	0

Harrison Bayou and Goose Prairie Creek – Perchlorate Data

Surface water samples are collected quarterly from each location in Harrison Bayou and Goose Prairie Creek, unless the sampling location is dry.

Surface Water Sample Data (in micrograms per liter)

Quarter	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**
Creek Sample ID	**Jul 1999**	**Sep 1999**	**Feb 2000**	**Apr 2000**	**Aug 2000**	**Dec 2000**	**Feb 2001**	**Apr 2001**	**July 2001**	**Oct 2001**	**Jan 2002**
GPW-1	<1.0U	-	4	<4.0 U	<4.0 U	<4.0 U	-	2.65	<4.0 U	<4.0 U	<4.0 U
GPW-3	<1.0U	<4.0 U	17	8	<4.0 U	<4.0 U	-	2.28	<4.0 U	<4.0 U	<4.0 U
HBW-1	-	<80.0 U	310	23	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-7	-	<8.0 U	370	110	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-10	-	<8.0 U	905	650	<4.0 U	-	<4.0 U	-	<4.0 U	-	-

Quarter	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**3rd**	**4th**	**2nd**	**3rd**	**4th**
Creek Sample ID	**June 2002**	**Sept 2002**	**Dec 2002**	**Feb 2003**	**June 2003**	**Aug 2003**	**July 2004**	**Dec 2006**	**May 2007**	**Aug 2007**	**Dec 2007**
GPW-1	<4.0 U	<4.0 U	18.3	18.6	59.9	-	2.25	-	<1.0 U	<1.0 U	10.7
GPW-3	<4.0 U	<4.0 U	5.49	12.6	14.7	-	2.2	-	<1.0 U	<1.0 U	7.48
HBW-1	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	99.3	<0.2U	<1.0 U	<1.0 U	122	<1.0 U
HBW-7	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	<4.0 U	<0.2U	<1.0 U	<1.0 U	1.02	<1.0 U
HBW-10	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	-	<0.2U	<1.0 U	<1.0 U	<1.0 U	<1.0 U

Quarter	**1st**	**2nd**	**3rd**	**4th**	**2nd**	**3rd**	**3rd**	**3rd**	**4th**	**1st**	**2nd**
Creek Sample ID	**Mar 2008**	**Jun 2008**	**Sep 2008**	**Dec 2008**	**May 2009**	**Jul 2009**	**Aug 2009**	**Sep 2009**	**Dec 2009**	**Mar 2010**	**Jun 2010**
GPW-1	27	<0.5U	<0.5U	<0.22U	16	<4U	NS	<1.2U	3.7	1.3J	<0.6U
GPW-3	21.9	9.42	1.1	<0.22U	8.9	<4U	NS	<0.6U	2.8	1.8J	<0.6U
HBW-1	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.5U	<0.6U
HBW-7	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	24	<1.2U	<0.275U	1.5U	<0.6U
HBW-10	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.2U	<0.6U

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

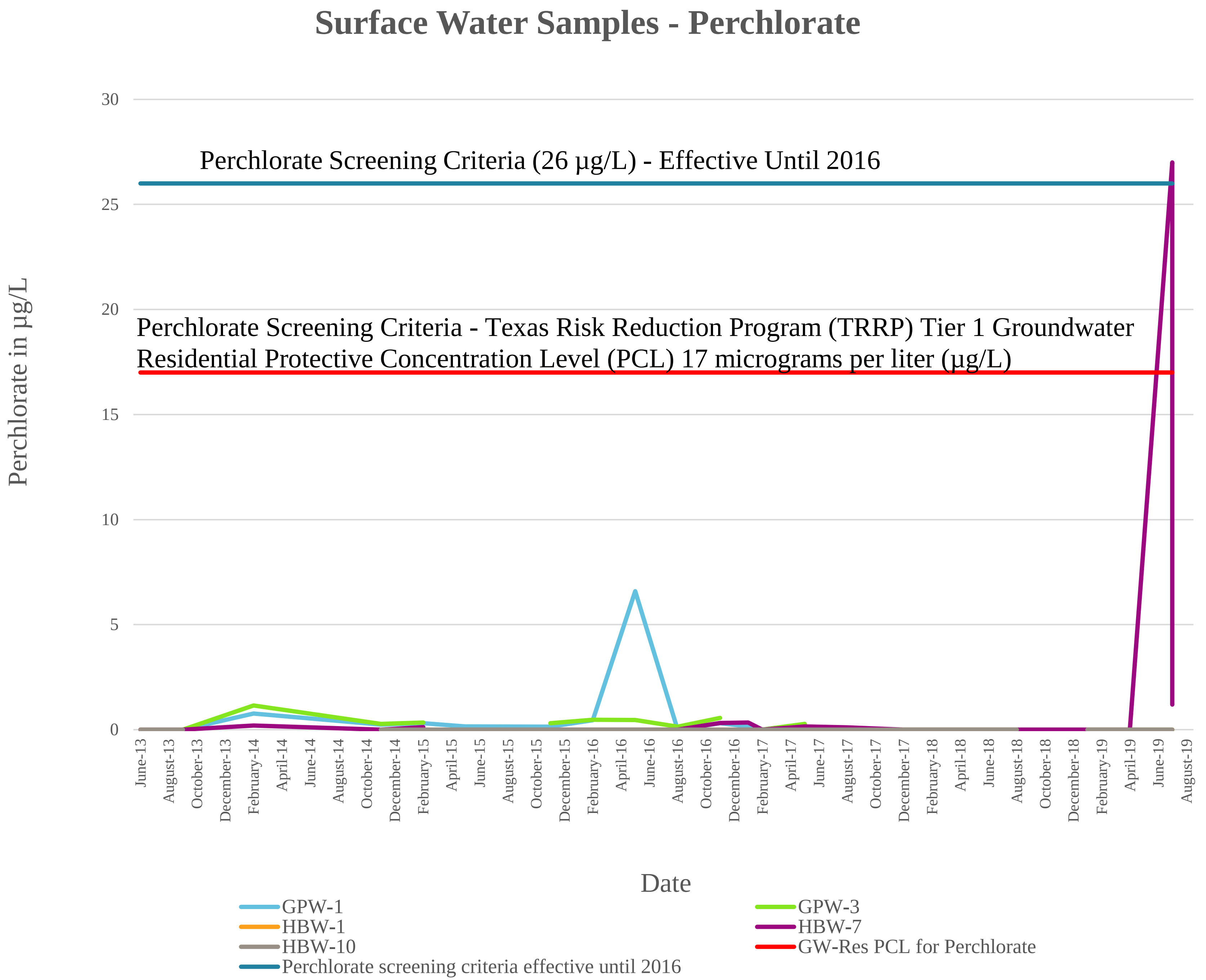
Quarter	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3nd**	**4th**	**1st**	**2nd**	**3rd**	**4th**
Creek Sample ID	**Jun 2013**	**Sept 2013**	**Dec 2013**	**Feb 2014**	**May 2014**	**Aug 2014**	**Nov 2014**	**Feb 2015**	**May 2015**	**Aug 2015**	**Nov 2015**
GPW-1	dry	<0.2 U	dry	0.766	dry	dry	0.244 J	0.311 J	0.156J	dry	0.142 J
GPW-3	dry	<0.2 U	dry	1.15	dry	dry	0.276 J	0.344 J	dry	dry	0.311 J
HBW-1	<0.2U	<0.2 U	dry	<0.2 U	dry	dry	<0.2 U	<0.2 U	dry	dry	<0.2 U
HBW-7	<0.2U	<0.2 U	dry	0.201 J	dry	dry	<0.2 U	0.124 J	dry	dry	<0.2 U
HBW-10	<0.2U	<0.2 U	dry	<0.2 U	dry	dry	<0.2 U	<0.2 U	dry	dry	<0.2 U

Quarter	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**
Creek Sample ID	**Feb 2016**	**May 2016**	**Aug 2016**	**Nov 2016**	**Feb 2017**	**May 2017**	**Aug 2017**	**Dec 2017**	**Mar 2018**	**June 2018**	**August 2018**
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	dry	<4.0 U	<4.0 U	dry	<2.0 U
GPW-3	0.474	0.457	0.141	0.563	<1 U	0.274	dry	<4.0 U	<4.0 U	dry	<2.0 U
HBW-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	1.1 J	<4.0 U	dry	<2.0 U
HBW-7	<0.2 U	<0.2 U	<0.2 U	0.318 J	<1 U	0.155	<0.2 U	<4.0 U	<4.0 U	dry	<2.0 U
HBW-10	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	0.111J	<4.0 U	<4.0 U	dry	<2.0 U

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

Quarter	4th	1st	2nd	3rd
Creek Sample ID	**Oct 2018**	**Jan 2019**	**April 2019**	**July 2019**
GPW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U
GPW-3	<2.0 U	<2.0 U	<2.0 U	<2.0 U
HBW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U
HBW-7	<2.0 U	<2.0 U	<2.0 U	27 (initial))/ 1.2 J (re-sample)
HBW-10	<2.0 U	<2.0 U	<2.0 U	<2.0 U

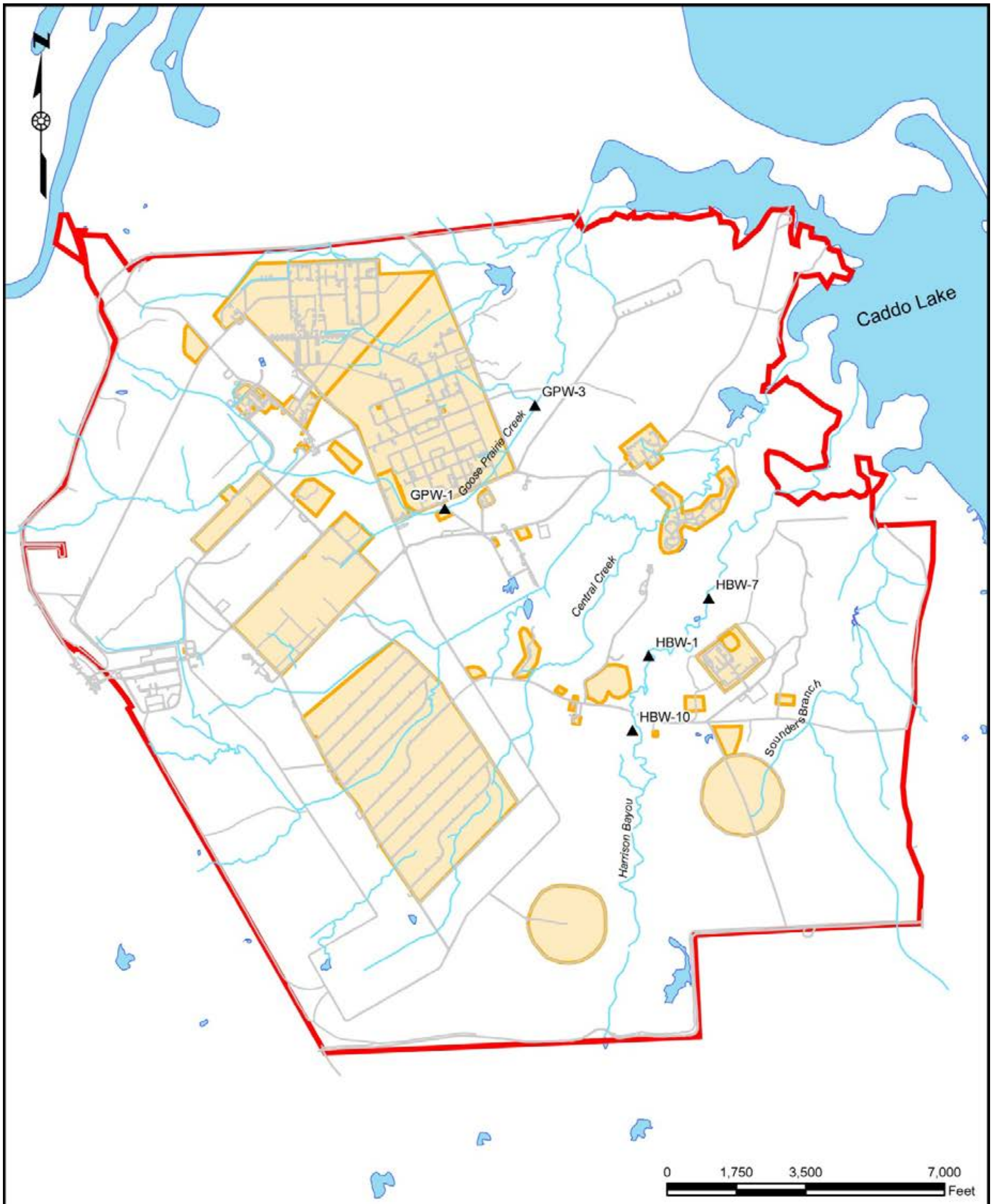
NS – not sampled U – non-detect J – Estimated Dry – no surface water



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

00954017

Longhorn Army Ammuntion Plant Creek Sampling Locations



Legend

- ▲ Surface Water Sampling Location
- Stream
- Road
- Site
- Lake

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

SURFACE WATER SAMPLING LOCATION

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Subject:	**Draft Minutes, Monthly Managers' Meeting (MMM), Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**LHAAP Site Trailer and via Teleconference**
Date of Meeting:	**16 January 2020– 10:30 Central Standard Time (CST)**

Attendees:

Army BRAC:	Rose M. Zeiler (RMZ)
USEPA:	Bill Rhotenberry (BR) and Kent Becher (KB)-USGS Liaison
AEC:	Andrew Maly (AM)
TCEQ:	April Palmie (AP)
USACE:	Aaron Williams (AW), Scottie Fiehler (SF) and Chris Graber (CG)
Bhate:	Kim Nemmers (KN), Scott Beesinger (SB) and Sally Smith (SS)
APTIM:	Bill Foss (BF) and Praveen Srivastav (PS) - on phone
USFWS:	Paul Bruckwicki (PB)

Action Items

Bhate/APTIM: SS took a moment to present SB with the 2019 Safety Award for Bhate. SS noted that this award is for going above and beyond in ensuring safety and leadership at LHAAP this past year.

Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update

Groundwater Treatment Plant (GWTP) - Storm damage to the area was discussed. SB said that three huge oak trees went down by the bayou and caught the power pole. The other two breaks were easy to fix and there was one cross arm to replace. SB said that the GWTP was down from 12:30 am Saturday through Wednesday morning. SB said that debris in the bayou by the outfall from the GWTP is causing a blockage. PB said that they have been clearing roads. PB said that John Stephens will work with SB on the issue. SB said that the reduced flow from the storm debris can cause an effect on the ability to discharge. SB said that there are two locations for sure and that it can be removed with a trackhoe.

KN explained that the air stripper blower had to be replaced. Since the replacement, KN explained that the air stripper was not treating trichloroethylene (TCE) and methylene chloride down to the maximum contaminant levels (MCLs). KN said that the blower was not pushing as much air as it started to fail and that the air stripper is not known to have been serviced in over 20 years of operation. KN pointed out that the air stripper was still very efficient after all this time. KN said that flow of air was reduced to improve the efficiency to allow for a longer contact time by the water on the media. KN said that the media was removed to evaluate the build-up. SB explained that the manway on the air stripper had to be removed and that the bolts had to be cutoff due to rusting. Visually, SB said that much of the media appear clean. SB said he had run some tests to evaluate an acid solution and he has come up with a solution that will work. SB said the next step is to determine how to pass the acid mixture through the media. KN explained that after the air stripper that there are two Granular Activated Carbon (GAC) vessels are off line. SB explained that the glass line for the one GAC vessel can't be fixed and so that one went offline around five years ago. SB said that the other GAC vessel was taken off line due to clogging and reducing overall GWTP flow. SB said that the GAC vessels were originally in place due to the amber coloring of the water from LHAAP-16. SB explained that there are no manways on top of the GAC vessels. KN said that they are awaiting information from a vendor but understand that these GAC vessels likely need to be removed and replaced.

SB explained that the GWTP damage from the storm was only to the discharge line from the acid tank. BLOC will be onsite tomorrow (1/17/2020) to make repairs to the conduit line. RMZ asked if the storm could have popped the valve on the acid tank to which SB said no. RMZ asked about the backup tank for the acid tank. SB said that the 10,000 gallon dilute acid vessel is onsite, next to the air stripper, and just needs to hook up to the tank. RMZ asked about what happens in the event of an acid release. SB stated that the acid would go into the sump and then a gas powered pump would be used to pump it into the onsite tank. RMZ confirmed that the sump is no longer automatic which SB confirmed. AP asked if this manual operation was due to the previous acid release which SB confirmed. KN also noted that less acid is being ordered and that frequency of ordering will increase.

KB asked about the water conveyance line breaks at LHAAP-18/24. SB said that the line to 18WW117 was replaced in October 2019.

LHAAP-03 – BF said that the excavations at LHAAP-03 are still full of water. BF said that some tarping pulled back a bit and that we would fix in the afternoon. AP asked if the soil was clean. BF explained that the soil was awaiting disposal following additional excavation of the remaining sidewall.

LHAAP-16- BF stated that the LHAAP-16 injections were completed before Christmas. BF said that the first round of design effectiveness monitoring has been completed with exception of biobarrier 2. AP asked if the sampling includes the new wells. BF said that this is just the initial monitoring following the injections, so it does not include the newly installed monitoring wells. RMZ asked if the groundwater is being analyzed for volatile organic compounds (VOC). BF clarified that the design effectiveness sampling includes bromide and total organic carbon analysis to evaluate the distribution. BF discussed the need for a second round of design effectiveness monitoring will be determined based upon the first round results. BF said that the first round of quarterly performance monitoring will be performed in March 2020 (three months after the injections were completed). RMZ said that the Remedial Action Completion Report (RACR) is due in May per the DI tracker. AP clarified that RACR will only have the design effectiveness sampling results.

LHAAP-17 – BF said that Area H is filling up with rainwater in the excavated area of LHAAP-17. AP asked if APTIM was looking to discharge to the GWTP. BF said that the current evaluation was for discharge to the bayou. BF said that the question is how much flow should be used in the calculation considering the dilution. BF said some backfill is present to potentially berm up an area. AP suggested using sand bags. BF said the covers over the stockpile areas were also pulled back a bit by the storm and will be addressed with additional sheeting. RMZ said that she will be discussing the enforceable schedule with the regulators in a separate meeting. BF asked if there was anything more formal needed for documenting the soil removal. BF said that a RACR was previously planned to include the groundwater extraction system. AW said that the next contract will include the RACR for the soils and groundwater. SF said that documentation of some sort is helpful. BF said that a summary report for the excavation has already been submitted to the Army, but didn’t include the backfilling. AP said that certain areas are done and could get regulator concurrence if backfilled. AP said that a discharge process is necessary for areas that are still contaminated. AW said that only the clean areas will need to be backfilled under the current contract.

RMZ said that we need an avenue for Regulatory approval of areas that do not require further excavation. AP said that an excavation report might be appropriate. AP said that a report prepared for LHAAP-17 to present excavation activities to date should not be called a removal report. BF said that data previously provided includes pre- and post-excavation sample information. RMZ said that the RACR will include both sets of excavation activities in one report. KN suggested the document describing the munitions and explosives of concern (MEC) response and additional excavation plans be called a Remedial Design (RD) Amendment for the additional soil removal efforts. AP clarified that the remedy will still be implemented aside from the MEC. RMZ stated that a new RD may be required and suggested this be an amended RD. RMZ agreed that an amended RD would be done under the new contract but that the groundwater RD should remain the same. KN asked if the extraction system could be installed by Bhate after the area is cleared and excavated. SF said the issue is that there would not be enough time to implement the 18 month operation of the groundwater remedy under the contract Bhate currently holds.

LHAAP-50 - BF said that the LHAAP-50 Underground Injection Control (UIC) package is being put together and will be submitted to TCEQ. BF said that APTIM is looking to complete the injections in late February or early March. KN asked how long the field work would take. BF said that it will be about two weeks based upon 12 points requiring injections.

KN asked everyone to refer to the Document and Issues Tracking Table dated January 16, 2020.

- **Task 1** (Project Management) – KN stated the Restoration Advisory Board (RAB) meeting was being held in the evening. RMZ said that Carol Fortune had resigned from the RAB. RMZ said that Mr. Pratt was attending that evening and that she would encourage attendees to consider joining the RAB, especially with a member resigning. KN thanked everyone for reviewing and finalizing the December 2019 MMM minutes after the holidays.
- **Task 3** (LHAAP-03) – BF stated that no documents were in progress as APTIM was awaiting the removal of the final soil contamination and the side wall sample.
- **Task 4** (LHAAP-04) **–** BF stated that the RACR is within internal APTIM review and should be to the Army in early February and the Regulators in March 2020. BF said that groundwater data collected after the injections to evaluate distribution was included with the January 2020 MMM information.
- **Task 5** (LHAAP-12) – BF stated that the annual groundwater sampling results from December 2019 would be provided at the February 2020 MMM.
- **Task 6** (LHAAP-16) – BF explained that the validated data from the first quarterly performance monitoring event will be provided in May 2020 because the sampling will not occur until March 2020.
- **Task 7** (LHAAP-17) **–** AW said that an executive decision had been made to eliminate groundwater extraction from Bhate's contract. AW explained the status of LHAAP-17 further since BR had not been involved during the remedial implementation. AW said that during the excavation munition items were found that were not expected based on the history of the site. AW said that the first few items discovered on August 30, 2019 and on September 7, 2019 were determined not to be live so the work continued. Near the end of the excavation the Army sent out an Ordinance and Explosives Safety Specialist (OESS), Hank Domme, who came out to watch the excavation and put MD items he found aside. On September 27, 2019, Mr. Domme found two, 81millimeter items that he could not determine to be empty. When the Explosive Ordnance Disposal (EOD) person came onsite, he determined the items were live and work was stopped. AW continued to explain that over 5,000 cubic yards of soil had been transported to East Texas Regional Landfill in Henderson, Texas that could have MEC in the soil. AM, AW, SF and CG met with Waste Connections, who manages the landfill. RMZ pointed out that there was notice provided to the landfill by the USACE that there could be live munitions items in the soil and they were asked to keep the soil segregated. AW said that he was then later told that the soil was buried. AW said that about 1,000 cubic yards was used for roadway base. About 2,000 cubic yards was used as landfill cover in 4 to 6-inch layers. AW said that less than 1,000 cubic yards was in a stockpile. CB, who is an OESS, walked the site and didn't observe

anything munitions-related. As to path forward, AW said that a couple of OESS personnel could walk the site with magnetometers. AW said that the work is currently planned to be completed by internal folks in about a month. BR said that the path forward made sense. AM said that the landfill operator is going to mark out where the soil has been spread so that they can take avoidance steps when they drill the gas vents. AM is to discuss the issue with the Army's legal due to the liability. AM said that longer term plan will be developed to ensure that the landfill remains a landfill for perpetuity but that plan may take a while to develop. AP and BR said they would like to be kept updated as work at the landfill, associated with LHAAP-17, progresses.

- **Task 9** (LHAAP-37) **–** BF stated that the Year 3 1st semiannual sampling results would be provided at the February 2020 MMM. PS stated that the Year 2 Annual RA(O) Report was submitted to the Army today for review.
- **Task 10** (LHAAP-46) –BF stated that Year 5 Annual RA-O data report is in internal APTIM review. RMZ asked about the new wells being installed. BF stated that the replacement well for the obstructed well had been installed and sampled and that a recommendation for a new well to the north was being included in the report.
- **Task 11** (LHAAP-50) –BF stated that the Year 5 RA-O Report is in internal review. BF stated that the RD/RAWP needs to be placed into the AR as it was approved by the EPA and TCEQ.
- **Task 12** (LHAAP-58) – KN stated that groundwater sampling of the eastern and western plumes had been completed in December 2019 and that the sampling results would be included in the February 2020 MMM. KN stated that the next sampling event is planned for March 2020 and will include only the western plume.
- **Task 13** (LHAAP-67) – BF explained that the Army comments on the Year 5 Annual RA-O Report had been received and that the draft should be out to the Regulators in February 2020 following resolution of those comments.
- **Task 14** (LHAAP-001-R and –003-R) - KN stated that LUC inspections would be completed early this year due to the storm that recently occurred.
- **Task 16** (GWTP) **–** KN indicated that the 3rd Quarter 2019 GWTP Report was issued to the Regulators for review. KN stated that the 4th Quarter 2019 GWTP Report was not being prepared yet as Bhate was awaiting validated data from December 2019.
- **Task 17** (LHAAP-18/24) – KN stated that the validated data from the LHAAP-18/24 sampling completed in December 2019 would be provided at the February 2020 MMM. KN also stated that the 4th Quarter 2019 GWTP Report would include this data.
- **Task 18** (Surface Water) – SB stated that he planned to collect the surface water samples the following week.
- **Task 19** (LUC Management Plan) – KN stated that the LUC Management Plan Update was completed and would be placed into the AR
- **Administrative Record (AR) –**RMZ said that the Restoration Advisory Board (RAB) members need to be provided documents quickly if they are available in hard copy or compact disc (CD) if they request it. RMZ said that the RAB does not need to wait for the AR to review a specific document. BF suggested putting a link to the major documents on the website. AP said that Laura-Ashley should be able to get the documents since she has an EPA TAG grant. George Rice does technical document review for Caddo Lake. AP said that it is helpful to have those major documents up on the website in addition to the AR. AP pointed out that the LHAAP-16 data from across the creek trichloroethylene (TCE) has not been reported formally. BF noted that the data would be included in the RACR for

LHAAP-16. RMZ said that the data should be presented to the pubic in the context of the entire remedy implementation and not piecemeal. All were in agreement.

Update on other DERP Sites:

- **LHAAP 18/24** –AW stated that the Army signed the Record of Decision (ROD) for LHAAP-18/24 and that the final ROD was submitted to EPA and TCEQ. AP said that she had not received a hard copy yet but had routed the ROD around for approvals. BR said that the ROD was in routing at the EPA also.
- **LHAAP-29** – AW said that there were no updates on LHAAP-29.
- **LHAAP-47** – RMZ stated that dates provided in the Enforceable Schedule would be missed. RMZ said that she needs to look at the Federal Facility Agreement for the criteria used to defer the enforceable schedule. RMZ stated that LHAAP-47 impacts were worse than what was expected based on the most recent data collected. AW explained that HDR, Inc.'s contract was being modified to allow for additional investigation based upon the Post-Screening Investigation (PSI) number 2. AW stated that the Interim Draft PSI was being reviewed as it was submitted on December 26, 2019. RMZ asked KB if he had reviewed the report because she wanted to discuss with them the scope of the additional investigation. KB said that he had reviewed and provided comments to BR.
- **Well Abandonment** – RMZ stated that there are a large number of wells that should be abandoned. AW stated that he is working on the list of wells and that this effort was already funded. KN stated that being able to abandon the wells in late February or early March would be ideal when we mobilize to complete LHAAP-50. AP asked about the data set being used. AW stated that he was using a historical consolidation of all the wells that had been installed. KB stated that he has an inventory list that he completed previously. RMZ asked KB to provide the list to which KB concurred.

USFWS – KN asked about buildings being demolished by the USFWS. SB said he was told that the phone building is coming out. PB said that the 703 D and E Records and computer building are coming down. PB said that the phone building may come down at some point and is being discussed. PB said that he current doesn't have a phone in his office due to the current phone system being so antiquated. PB confirmed that the phone lines could be affected at some time in the future however.

PB said that USFWS would coordinate with SB on the tree removal. PB said that these trees are twisted off. PB believes that the tornado may have not touched own but bounced as it passed over the refuge. BF said that it was reported that there were short-lived "spin-up" type tornados occurring within the larger line of storms that moved through.

Schedule Next Managers' Meeting

The next MMM will be held on Wednesday, February 19, 2020 at 1:00 pm CST via conference call.

Meeting concluded at approximately 12:00 pm CST.

ACRONYM LIST

AEC	Army Environmental Command
AP	April Palmie
APTIM	APTIM Federal Services, LLC
AR	Administrative Record
AW	Aaron Williams
BF	Bill Foss
Bhate	Bhate Environmental Associates, Inc.

BR	Bill Rhotenberry
BRAC	Base Realignment and Closure
CD	Compact Disc
CG	Chris Graber
CST	Central Standard Time
DERP	Defense Environmental Restoration Program
EOD	Explosive Ordnance Disposal
GAC	Granular Activated Carbon
GWTP	Groundwater Treatment Plant
KB	Kent Becher
KN	Kim Nemmers
LHAAP	Longhorn Army Ammunition Plant
MCL	Maximum Contaminant Level
MMM	Monthly Managers' Meeting
MNA	Monitored natural attenuation
PB	Paul Bruckwicki
PBR	Performance-Based Remediation
PP	Proposed Plan
PPM	Parts per million
PS	Praveen Srivastav
PSI	Post-Screening Investigation
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RA(O)	Remedial Action – Operation
RAWP	Remedial Action Work Plan
RD	Remedial Design
RMZ	Rose M. Zeiler
ROD	Record of Decision
SB	Scott Beesinger
SF	Scottie Fiehler
SS	Sally Smith
TCE	Trichloroethylene
TCEQ	Texas Commission on Environmental Quality
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

LHAAP Validated Data Packages for
January 2020 Monthly Manager's Meeting

LHAAP Area	Analytic Method
LHAAP-04	***November 2019 Post-Injection Sampling***
	Total Organic Carbon (SM5310C)

LHAAP-04 Post Injection Performance Monitoring
November 2019

		Location Code	04WW05		04WW07		04WW09		04WW10	
		Sample ID	04WW05-191113-Post-inj		04WW07-191113-Post-inj		04WW09-191113-Post-inj		04WW010-191113-Post-inj	
		Sample Date	11/13/2019		11/13/2019		11/13/2019		11/13/2019	
		Location Description:	Shallow Zone, Within Treatment Area		Shallow Zone, Within Treatment Area		Shallow Zone, Within Treatment Area		Shallow Zone, Within Treatment Area	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Total Organic Carbon	mg/L	NV	32.8		35.3		680		65	

Notes:

MCL - Maximum Contaminant Limit

NV - No value established

mg/L - milligrams per liter

ID - identification

Val Qual - validation qualifier

00954026

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

February 5, 2020

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: February 2020 Underground Injection Control Substantive Requirements Notification for Contingency Remedy at LHAAP-50, Longhorn Army Ammunition Plant, Karnack, Texas

Dear Ms. Palmie,

The above-referenced document is being transmitted to you for your records. We are presumptively complying with the substantive requirements of 30 Texas Administrative Code (TAC) §331, Subchapters A, C, and H for Class V Injection Wells. Therefore, unless we hear in the negative within 30 calendar days (Mar 6, 2020), the injections will be implemented at Site LHAAP-50 mid to late March 2020.

The document was prepared by Bhate Environmental Associates, Inc., 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.

Sincerely,

Rose M. Zeiler

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

Copies furnished:
W. Rhotenberry, USEPA Region 6, Dallas, TX (1 hard copy and 1CD)
P. Bruckwicki, Caddo Lake NWR, TX (1 hard copy and 1 CD)
R. Smith, USACE, Tulsa District, OK (1 hard copy and 1 CD)
A. Williams, USACE, Tulsa District, OK (1 CD)
A. Maly, USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 hard copy and 1 CD))
P. Srivastav, APTIM, Houston, TX (1 hard copy and 1 CD)

00954027

MEMORANDUM FOR RECORD

DATE:	February 5, 2020	
PROJECT NAME:	Contingency Remedy for LHAAP-50, Longhorn Army Ammunition Plant, Karnack, Texas	
TO:	Rose Zeiler Rick Smith Aaron Williams	Site Manager Project Manager Project Engineer
FROM:	Kimberly Nemmers	Bhate Project Manager, Cell No. 303-550-9239
SUBJECT:	**LHAAP-50 Contingency Remedy Underground Injection Control Substantive Requirements Notification, Longhorn Army Ammunition Plant, Karnack, TX (Contract No. W9128F-13-D-0012, Task Order No. W912BV17F0150)**	

INTRODUCTION

Remedial activities are required under the Explanation of Significant Differences, Record of Decision (ROD) for Contingency Remedy issued for the LHAAP-50 Former Sump Water Tank (U.S. Army 2019). The 3rd Annual Remedial Action Operation Report for LHAAP-50 indicated evidence of plume migration, increasing concentrations of perchlorate and trichloroethene (TCE) and geochemical conditions that are not optimal for monitored natural attenuation (MNA) and recommended that an in situ bioremediation (ISB) contingency remedy be implemented to enhance MNA. The Remedial Design/Remedial Action Work Plan (RD/RAWP) for the contingency remedy was submitted to Texas Commission on Environmental Quality (TCEQ) for review in October 2019 (U.S. Army 2019) and the Draft Final document was approved by TCEQ in January 2020.

As part of the selected remedy, in situ bioremediation (ISB) will be conducted in the most contaminated portion of the upper shallow and lower shallow groundwater zones. The ISB remedy includes 1) the installation of bio-injection grid in the vicinity of 50WW14 in the upper and lower shallow zones; 2) the installation of bio-injection grid in the vicinity of 50WW12 in the upper shallow zone (**Enclosure 1**, Attachment B).

ISB is planned to be conducted at LHAAP-50 in March 2020. The enclosed Class V Injection Well Inventory Form (**Enclosure 1**) and TCEQ Core Data Form (**Enclosure 2**) comply with the substantive requirements for construction, operation, and closure under 30 Texas Administrative Code (TAC) §331, Subchapters, A, C, and H (the Applicable or Relevant and Appropriate Requirements [ARARs] for underground injection control).

SITE HISTORY

LHAAP-50 (former sump water tank) is in the north-central portion of LHAAP and covers an area of approximately 1 acre (Class V Injection Well Inventory Form, **Enclosure 1**, Attachment A, Topographic Quadrangle Map). When operational, LHAAP-50 contained a 47,000-gallon capacity aboveground storage tank (AST) which received industrial wastewater from various industrial waste production sumps throughout LHAAP between 1955 and 1988. After the solids were filtered, the storage tank contents were discharged into Goose Prairie Creek. The AST is no longer present.

The U.S. Army issued the Final ROD for LHAAP-50 in September 2010 that was signed by the Army on 23 September 2010 and co-signed by the USEPA on 30 September 2010. TCEQ concurred with the ROD on 4 October 2010. The remedy selected in the ROD included soil removal, MNA and land use controls (LUCs). The ROD stated that a contingency remedy to enhance MNA would be implemented to reach the RAOs if MNA was found to be ineffective and would be documented in the Explanation of Significant Difference (ESD). The COCs identified in the LHAAP-50 ROD included perchlorate and VOCs including tetrachloroethene (PCE), TCE, 1,1-dichloroethene (DCE), 1,2-dichloroethane (DCA), cis-1,2-dichloroethene (DCE) and vinyl chloride in groundwater and perchlorate in soil. Approximately 183 cubic yards of perchlorate contaminated soil was removed and disposed offsite in September 2013 as described in the Final Remedial Action Completion Report (AECOM 2016).

The 3rd Annual RAO Report (APTIM 2018) indicated that MNA was found to be ineffective. The TCE plume had expanded beyond its baseline footprint with increasing concentration trends at monitoring well 50WW12. TCE and Perchlorate plumes from the 4th Annual RAO events conducted in November 2017 and May 2018 are included **Enclosure 1**, Attachment E, Figure 1-5. Therefore, an ESD to the ROD (U.S. Army 2019) was prepared to document the significant change from the ROD selected remedy of MNA to implement the contingency remedy and proposed implementation of ISB to enhance MNA. The ISB contingency remedy is consistent with the ROD requirement to enhance MNA. The U.S. Army signed the ESD on 6 August 2019 and the U.S. Environmental Protection Agency (USEPA) signed the ESD on 29 August 2019. TCEQ concurred with the ESD on 23 July 2019. The Draft Final RD/RAWP for the contingency remedy was approved by TCEQ and EPA in January 2020 and presents the remedial design, inspection and maintenance requirements, and LUC requirements associated with LHAAP-50.

PLANNED ACTION

The remedy will include ISB at LHAAP-50 to remediate groundwater impacted with VOCs and perchlorate. The implementation of ISB using biogrid applications will involve the injection of an electron donor and a microbial consortium capable of biodegrading primary VOCs and perchlorate. The Material Safety Data Sheets for the injectates are included in Class V Injection Well Inventory Form, **Enclosure 1**, Attachment H. The following injectates will be used:

- An emulsified vegetable oil (EVO) product, EDS-ER™ manufactured by Tersus Environmental will be injected in the vicinity of monitoring wells 50WW14 and 50WW12 (Class V Injection Well Inventory Form, **Enclosure 1**, Attachment B, Figure 3-1). A microbial dechlorinating culture (SDC-9™), and microbial nutrients (diammonium phosphate and Vitamin B12) will be injected into the subsurface in these areas.

Per Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7, the Army is presumptively complying with substantive requirement of construction, operation and closure under 30 TAC §331, Subchapters, A, C, and H (ARARs for underground injection control).

Enclosures:
1. Class V Injection Well Inventory Form
2. TCEQ Core Data Form

ENCLOSURE 1

CLASS V INJECTION WELL INVENTORY FORM

Texas Commission on Environmental Quality
Class V Injection Well
Inventory/Authorization Form

Submit To:

For TCEQ Use Only
Reg. No. __________________
Date Received ______________
Date Authorized _____________

Section I General Information
Provide the information in items 1 through 7

1. TCEQ Program Area (PST, VCP, IHW, etc.):
2. Agent/Consultant:
3. Name: Longhorn Army Ammunition Plant, LHAAP-50

   Address (Street, City, County, State, and Zip Code) or location description (if no address is available): North central portion of LHAAP, bounded by South Crocket Avenue to the northeast, a drainage ditch to the west, a railroad spur to the south, and Goose Prairie Creek to the north.
4. Latitude and Longitude (degrees-minutes-seconds) and method of determination (GPS, TOPO, etc.) (Attach a Topographic Quadrangle map which identifies the facility location relative to major streets or roadways as Attachment A.)

   Latitude: 32° 40' 518" N; Longitude: 94° 8' 25.569" W. LHAAP-50 Site Location Map (Figure 1-2 from the RD/RAWP) is also included in **Attachment A**.
5. Type of Well Construction (Vertical Injection, Subsurface Fluid Distribution System, Infiltration Gallery, Temporary Injection Points, etc.) and Number of Injection Wells:

   12 direct-push temporary injection points will be used to distribute the injectate mixture into the lower shallow and upper shallow zone. Injections will be conducted in the upper shallow and lower shallow zone using 6 direct push injection points in the vicinity of monitoring well 50WW14 and injections will be conducted in the upper shallow zone using 6 direct push injection points in the vicinity of monitoring well 50WW12.
6. Description regarding purpose of Injection System. Attach a Site Map as Attachment B (Attach the Approved Remediation Plan [if appropriate]):

   LHAAP-50, Former Sump Water Tank, contained a 47,000-gallon capacity aboveground storage tank which received industrial wastewater from various industrial waste production sumps throughout LHAAP between 1955 and 1988. The AST is no longer present.

The COCs for LHAAP-50 include dissolved phase perchlorate and VOCs including tetrachloroethene (PCE), TCE, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride in groundwater, and perchlorate in soil. There are no COCs in other environmental media at the site. The contingency remedy described in the approved RD/RAWP is in situ bioremediation (ISB) to enhance the MNA remedy.

To implement ISB, emulsified vegetable oil (EVO), diammonium phosphate (microbial nutrient), and water will be injected into the subsurface at 12 locations shown on **Attachment B** (Figure 3-1 from the RD/RAWP) The injectate mixture will consist of approximately 2% (by volume) solution of EVO (**Attachment C**).

The Remedial Design/Remedial Action Work Plan (RD/RAWP) has been approved by TCEQ and USEPA and the approved injection plan from the RD/RAWP is included as **Attachment B**.

7. Water Well Driller/Installer:

Section II Proposed Down Hole Design

Attach a diagram signed and sealed by a licensed engineer as Attachment C

Name of String	Size	Setting Depth	Sacks Cement/Grout - Slurry Volume - Top of Cement	Hole Size	Weight (lbs/ft) PVC/Steel
Casing	N/A (See Note 1 below)	N/A	N/A	N/A	N/A
Tubing	N/A	N/A	N/A	N/A	N/A
Screen	N/A	N/A	N/A	N/A	N/A

Note 1: The injection of the amendments will be performed via direct-push injection points. The description of the direct-push injection points is provided in Section III below. There will be no permanent casing, tubing, or screens associated with the direct-push injection points.

Section III Proposed Trench System, Subsurface Fluid Distribution System, or Infiltration Gallery

Attach a diagram signed and sealed by a licensed engineer as Attachment D

8. System(s) Dimensions: Approximately 6,000 square feet near monitoring wells 50WW14 and 50WW12.
9. System(s) Construction: The fluid distribution system will consist of a temporary/mobile tanks/containers, hoses, a bulk storage tank, mixing equipment, injection pump, and volume and metering control equipment. Injection points will be advanced using a tractor mounted rig with a direct-push technology (DPT) hammer. The injectate mixture will be injected using at each proposed direct-push point at 4-foot intervals in the target treatment area. Under this approach, drilling rods (injection probes) are advanced to the proposed injection interval. Injectate mixture will be pumped down through the DPT drilling rods (acting as a temporary well casing) to the injection interval and injectate will be forced through the ports in the rods to the surrounding formation. The tools are then advanced to the next injection depth and the material is again pumped through the rods. This cycle is repeated to provide coverage across the entire vertical treatment interval. Injection flow rates are expected to range from 2 to 6 gallons per minute and an attempt will be made to keep injection pressures below 25 pounds per square inch (psi).

   The injection target intervals are shown in **Attachment C**, and a sample temporary DPT injection point diagram is included as **Attachment D.**

Section IV Site Hydrogeological and Injection Zone Data

Provide the information in items 10 through 26

10. Name of Contaminated Aquifer: Upper Shallow/Lower Shallow Aquifer
11. Receiving Formation Name of Injection Zone: Unconsolidated Material
12. Well/Trench Total Depth:

    Injection point depths in the vicinity of 50WW14 : 18-60 feet (ft) below ground surface (bgs); Injection depth in the vicinity of 50WW12: 17-35 ft bgs.
13. Surface Elevation: Approximately 191-205 ft
14. Depth to Ground Water: Shallow Zone (upper/lower shallow): 17 to 26 ft bgs; Intermediate Zone: 24 ft bgs;

    Injection Zone Depth: In the vicinity of monitoring well 50WW14: 18 to 60 ft bgs; In the vicinity of 50WW12: 17-35 ft bgs.
15. Injection Zone vertically isolated geologically? ☒Y/☐N Impervious Strata between Injection Zone and nearest Underground Source of Drinking Water:

    Name: Upper Shallow, Lower Shallow, and Intermediate Zone
    Thickness:

    Upper Shallow: 0 to 30 ft bgs
    Lower Shallow: 30 to 60 ft bgs
    Intermediate Zone: >100 ft bgs
16. Provide a list of contaminants and the levels (parts per million [ppm]) in contaminated aquifer.

    Attach as Attachment E: Perchlorate, PCE, TCE, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride are the COCs in groundwater. See **Attachment E** showing recent (May 2018) levels of contamination in parts per billion.
17. Horizontal and Vertical extent of contamination and injection plume

    Attach as Attachment F: The horizontal extent of contamination is shown in **Attachment E**. The contamination is limited to the shallow zone. There is no impact to the intermediate zone of the aquifer. A separate Attachment F is not provided.
18. Formation (Injection Zone) Water Chemistry (Background levels) TDS, etc.

    Attach as Attachment G: Water chemistry data (dissolved oxygen, oxidation reduction potential, pH, turbidity, etc.) will be collected in the baseline sampling event and will be reported in the Remedial Action Completion Report. A separate Attachment G is not provided.
19. Injection Fluid Chemistry in ppm at point of injection

    Attach as Attachment H: The injection fluid chemistry consists of approximately 2% (by volume) solution of EVO (carbon substrate). The EVO product, EDS-ER™, will be supplied by Tersus Environmental. The approximate injectate mixture quantities are shown on the table in **Attachment C**. See **Attachment H** for Safety Data Sheet.

Water for the solution will be procured from the Leigh Water Company in Karnack, Texas from their potable water supply.

20. Lowest Known Depth of Ground Water with < 10,000 ppm TDS: Unknown
21. Maximum injection Rate/Volume/Pressure: Rate: 2 to 10 gallons per minute; Pressure: 10 to 40 psi (An attempt will be made to keep injection pressures below 25 psi). However, in some cases, depending on the lithology the injection pressure may be higher

    In the vicinity of 50WW14: Volume: 5,103 gallons per point

    In the vicinity of 50WW12: Volume: 2,188 gallons per point
22. Water wells within 1/4 mile radius (attach map as Attachment I): None
23. Injection wells within 1/4 mile radius (attach map as Attachment I): None
24. Monitor wells within 1/4 mile radius (attach driller's logs and map as Attachment I): See **Attachment I**, quarter mile map which indicates approximately 39 monitoring wells within a quarter mile radius from the planned injections. Boring logs and/or well construction logs were not available for all locations shown on the map. All the available logs are included in the attachment.
25. Sampling frequency: Quarterly performance sampling will be conducted for eight quarters following completion of injections. The sample results will be included in monitoring reports that will be submitted to TCEQ.
26. Known hazardous components in injection fluid: There are no hazardous components in the injection fluid.

Section V Site History
Provide the information in items 27 through 30

27. Type of Facility:
28. Contamination Dates: 1940s to 1980s
29. Original Contamination (VOCs, TPH, BTEX, etc.) and Concentrations (Attach as Attachment J): The COCs in groundwater at LHAAP-50 are Perchlorate, PCE, TCE, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride. Current concentration information is provided in **Attachment E**. No separate Attachment J is provided.
30. Previous Remediation: Attach results of any previous remediation as Attachment K.

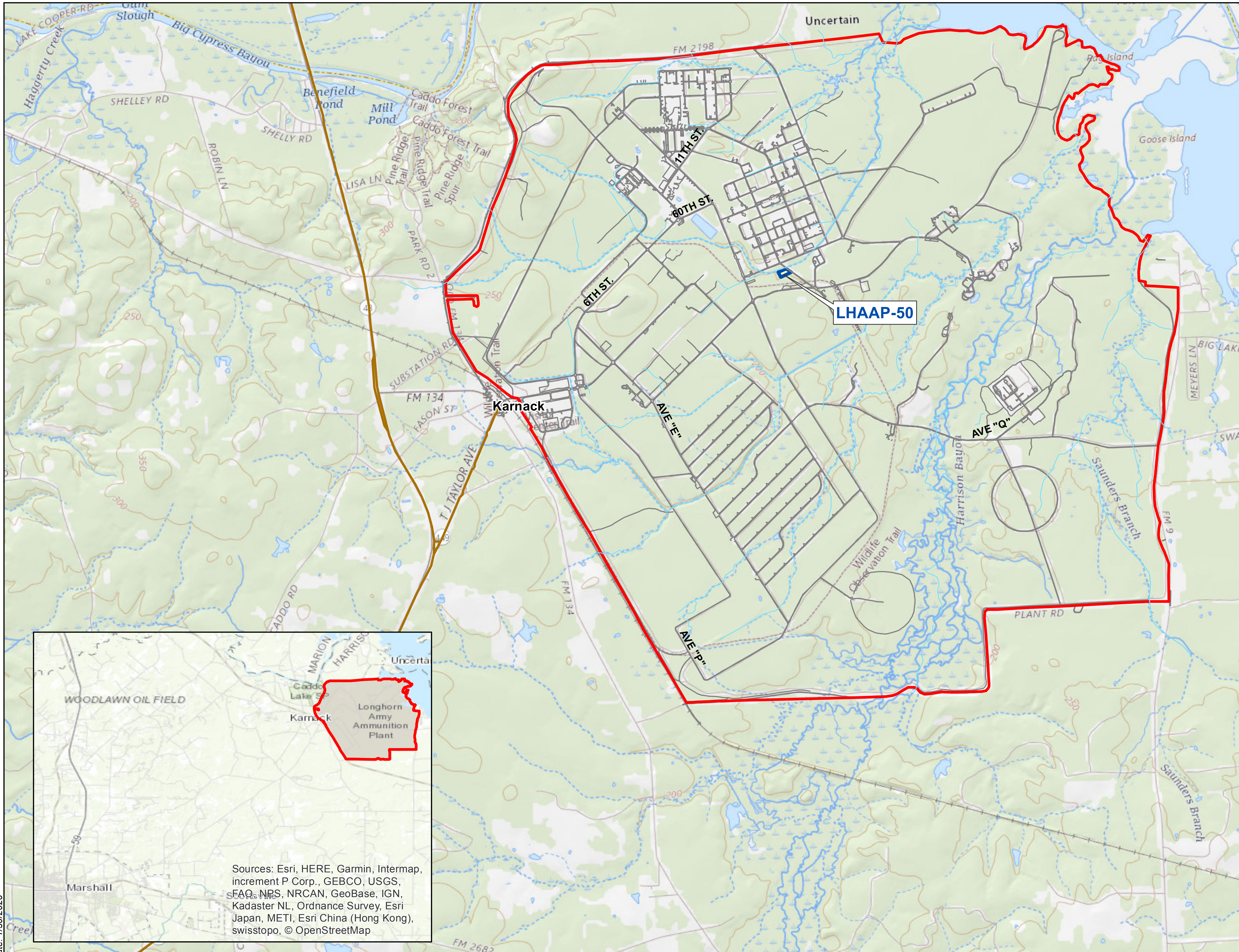
    Soil excavation of perchlorate contaminated soil was conducted in July 2013 and was documented in the Final Remedial Action Completion Report, LHAAP-50, Former Sump Water Tank dated June 2016. A separate Attachment K is not provided.

<<NOTE>> Authorization Form should be completed in detail and authorization given by TCEQ before construction, operation, and/or conversion can begin. Attach additional pages as necessary.

Attachment A

Site Topographic Map & Site Vicinity Map

- **Figure 1-2, LHAAP-50 Site Location Map**
- **Figure 1-3, Site Plan, LHAAP-50**



Stream
Road
LHAAP Boundary
LHAAP-50 Site Boundary

N

0 1,500 3,000 Feet

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Figure 1-2

LHAAP Site Vicinity Map

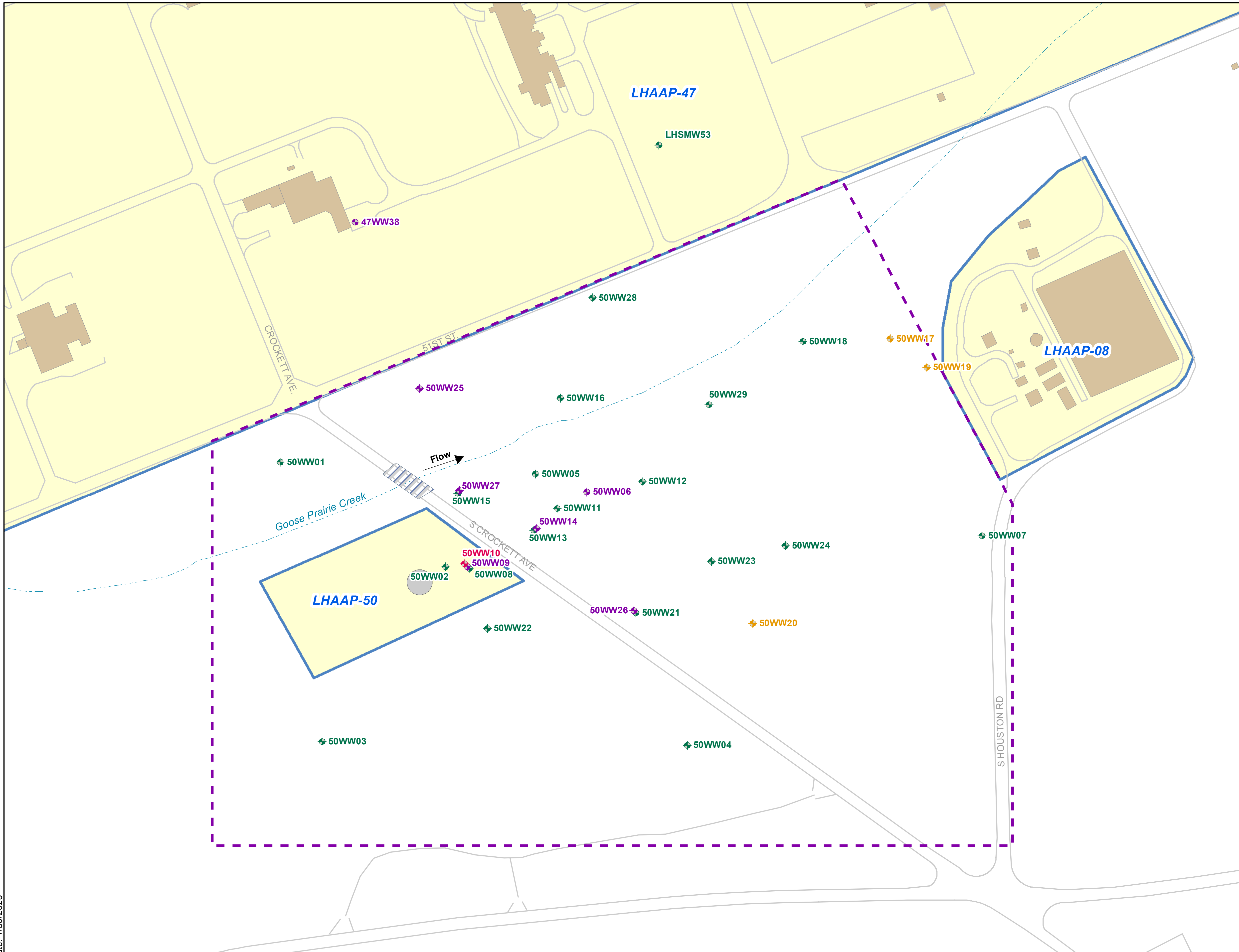
LHAAP-50

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 1/30/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP50\UIC\LHAAP50_SiteLocationMap.mxd

00954038



Lower Shallow Monitor Well
Upper Shallow Monitor Well
Fully Penetrating Shallow Monitor Well
Intermediate Monitor Well
Goose Prairie Creek
Roads
Land Use Control Boundary
Bridges
Former Storage Tank Location
Buildings
Site Boundaries

N

0 75 150 Feet

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Figure 1-3

Site Plan

LHAAP-50

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 1/30/2020

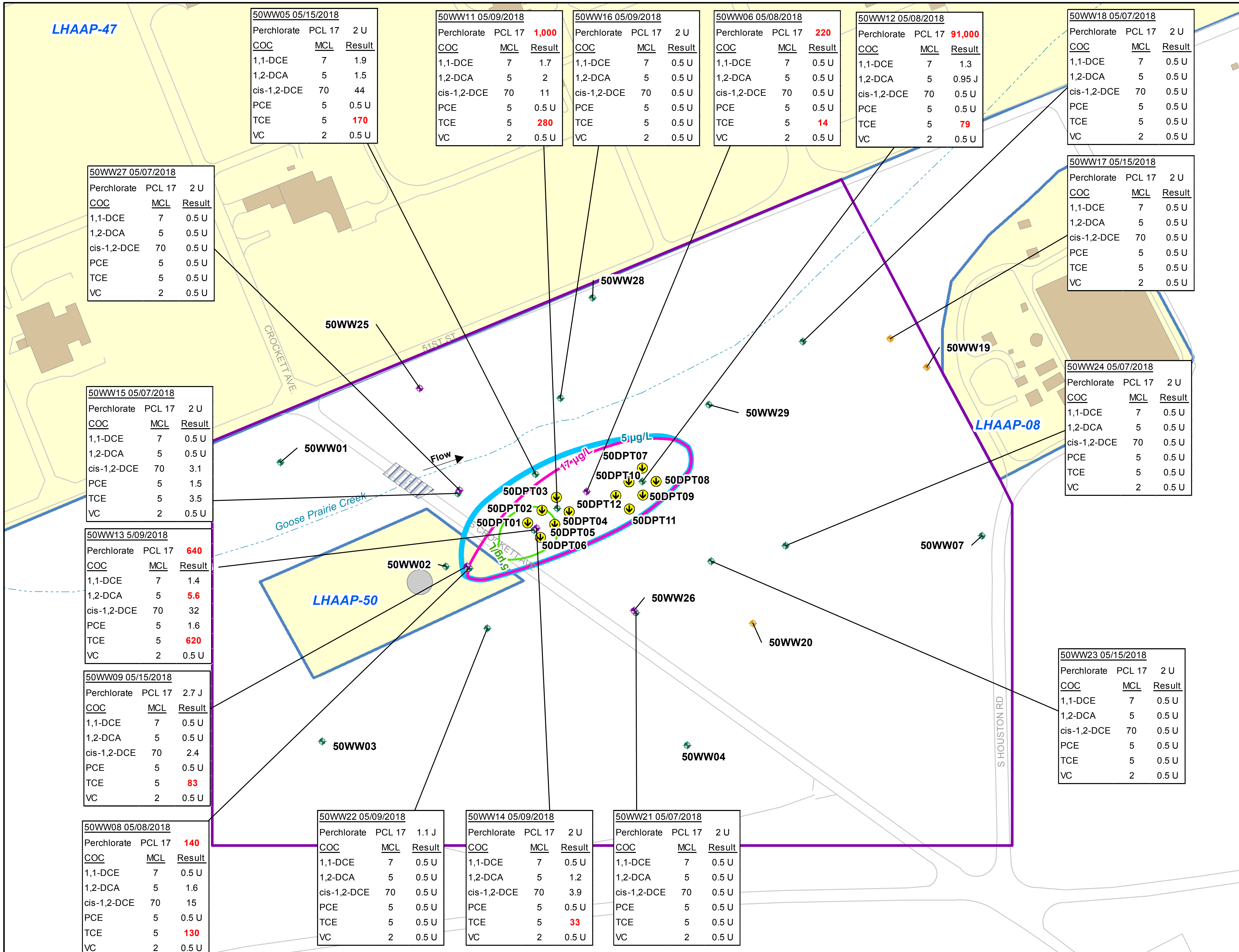
Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP50\UIC\LHAAP50_SitePlan.mxd

Attachment B

Proposed Injection Locations

- **Figure 3-1, LHAAP-50 Injection Plan, RD/RAWP**

00954040



50WW05 05/15/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	1.9
1,2-DCA	5	1.5
cis-1,2-DCE	70	44
PCE	5	0.5 U
TCE	5	170
VC	2	0.5 U

50WW11 05/09/2018

Perchlorate	PCL 17	1,000
COC	MCL	Result
1,1-DCE	7	1.7
1,2-DCA	5	2
cis-1,2-DCE	70	11
PCE	5	0.5 U
TCE	5	280
VC	2	0.5 U

50WW16 05/09/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW06 05/08/2018

Perchlorate	PCL 17	220
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	14
VC	2	0.5 U

50WW12 05/08/2018

Perchlorate	PCL 17	91,000
COC	MCL	Result
1,1-DCE	7	1.3
1,2-DCA	5	0.95 J
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	79
VC	2	0.5 U

50WW18 05/07/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW27 05/07/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW17 05/15/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW15 05/07/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	3.1
PCE	5	1.5
TCE	5	3.5
VC	2	0.5 U

50WW24 05/07/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW13 5/09/2018

Perchlorate	PCL 17	640
COC	MCL	Result
1,1-DCE	7	1.4
1,2-DCA	5	5.6
cis-1,2-DCE	70	32
PCE	5	1.6
TCE	5	620
VC	2	0.5 U

50WW09 05/15/2018

Perchlorate	PCL 17	2.7 J
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	2.4
PCE	5	0.5 U
TCE	5	83
VC	2	0.5 U

50WW23 05/15/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW08 05/08/2018

Perchlorate	PCL 17	140
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	1.6
cis-1,2-DCE	70	15
PCE	5	0.5 U
TCE	5	130
VC	2	0.5 U

50WW22 05/09/2018

Perchlorate	PCL 17	1.1 J
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW14 05/09/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	1.2
cis-1,2-DCE	70	3.9
PCE	5	0.5 U
TCE	5	33
VC	2	0.5 U

50WW21 05/07/2018

Perchlorate	PCL 17	2 U
COC	MCL	Result
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

Lower Shallow Monitor Well
Upper Shallow Monitor Well
Fully Penetrating Shallow Monitor Well
Proposed DPT Point
1,2-DCA Contour
Perchlorate Contour (*Dashed where inferred*)
TCE Contour
Goose Prairie Creek
Roads
Land Use Control Boundary
Bridges
Former Storage Tank Location
Buildings
Site Boundaries

Notes:
1. All concentrations are shown in micrograms per liter (µg/L).
2. 1,1-DCE = 1,1-dichlorothene
1,2-DCA = 1,2-dichlorethane
cis-1,2-DCE = cis-1,2-dichloroethene
PCE = tetrachloroethene
TCE = trichloroethene
VC = vinyl chloride
MCL = maximum concentration level
PCL = protective concentration level
U = below detection limit
J = estimated value
COC = contaminant of concern
3. Results in red are above the MCL or PCL.

0 75 150
Feet

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Figure 3-1

Proposed Remediation Plan
Remedial Action Work Plan,
Contigency Remedy,
LHAAP-50
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP50\RAWP\LHAAP50_PropRemPlan.mxd Date: 10/31/2019

Attachment C

Target Injection Intervals

- **Table 4-1, Injection Locations and Amendment Volumes, RD/RAWP**

Table 4-1
Injection Locations and Amendment Volumes

DPT Location	Amendment Volume per Location						DPT Injection Depths (ft bgs) [a]	Nearest Monitoring Well	Lithology (ft bgs)
	Gallons of EVO (EDS-ER™ or Equivalent)	Liters of SDC-9™ (1.0E11)	Pounds of Nutrients (DAP)	Pounds of Buffer (sodium bicarbonate)	Gallons of Water	Total Injection Volume (gallons)			
50DPT01	110	12	308	37	4,990	5,103	18 - 60	50WW14	0 - 2 ft bgs: Silty fine sand 2 - 15 ft bgs: Silty clay 15 - 30 ft bgs: Silty fine sand 30 - 61.5 ft bgs: Poorly graded sand with silt 58.5 ft bgs: Bottom of well casing
50DPT02	110	12	308	37	4,990	5,103	18 - 60		
50DPT03	110	12	308	37	4,990	5,103	18 - 60		
50DPT04	110	12	308	37	4,990	5,103	18 - 60		
50DPT05	110	12	308	37	4,990	5,103	18 - 60		
50DPT06	110	12	308	37	4,990	5,103	18 - 60		
50DPT07	48	5	132	16	2,139	2,188	17 - 35	50WW12	0 - 2 ft bgs: Silt 2 - 10 ft bgs: Lean clay with sand 10 - 35 ft bgs: Poorly graded sand
50DPT08	48	5	132	16	2,139	2,188	17 - 35		
50DPT09	48	5	132	16	2,139	2,188	17 - 35		
50DPT10	48	5	132	16	2,139	2,188	17 - 35		
50DPT11	48	5	132	16	2,139	2,188	17 - 35		
50DPT12	48	5	132	16	2,139	2,188	17 - 35		

Notes:

Table will be updated with quantities of buffer (Sodium Bicarbonate) which will be determined based on buffer capacity tests.

[a] The DPT injection depths may be altered in the field depending on lithology.

DAP - Diammonium Phosphate

DPT - direct-push technology

EDS-ER™ - electron donor solution-extended release

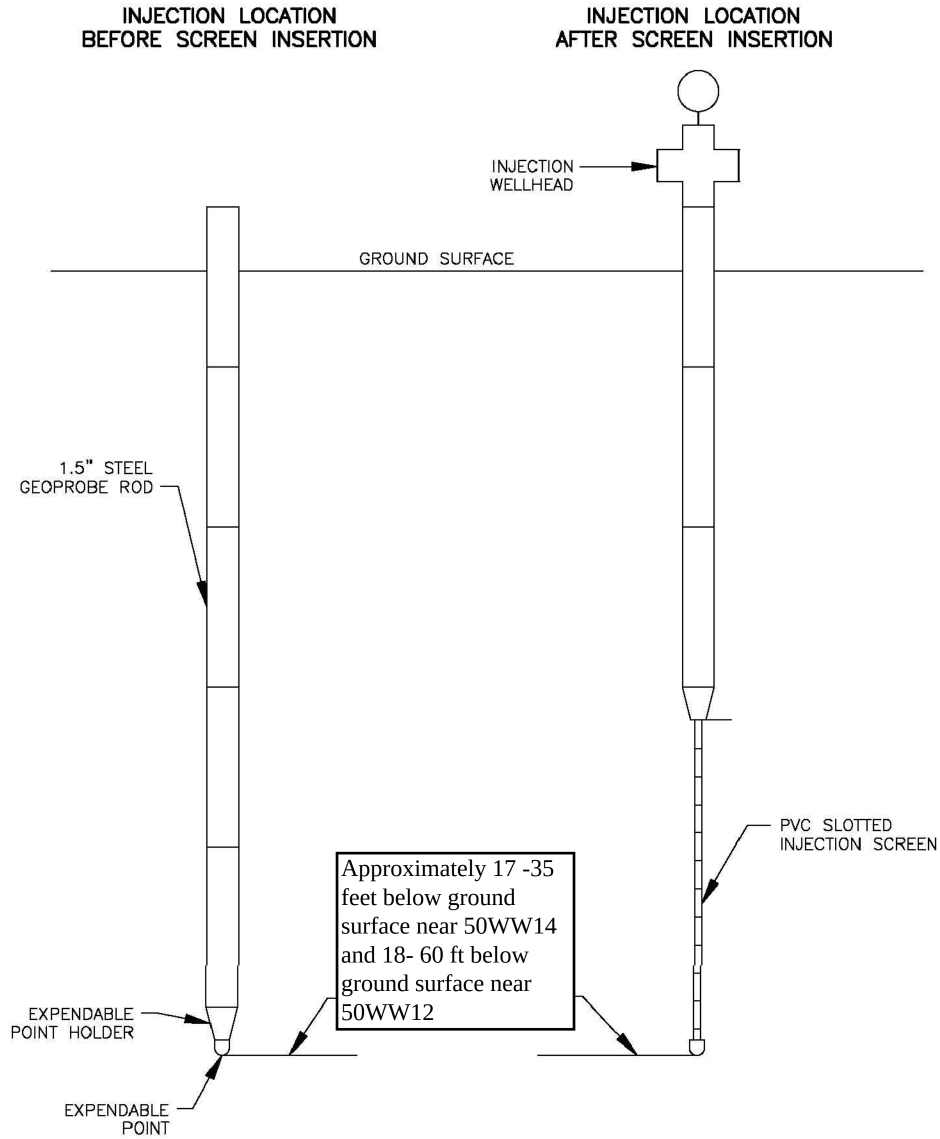
EVO - emulsified vegetable oil

ft bgs - feet below ground surface

SDC-9™ - APTIM's dechlorinating culture

Attachment D

Typical DPT Temporary Injection Point Diagram



Not to Scale

Project Number: 501032

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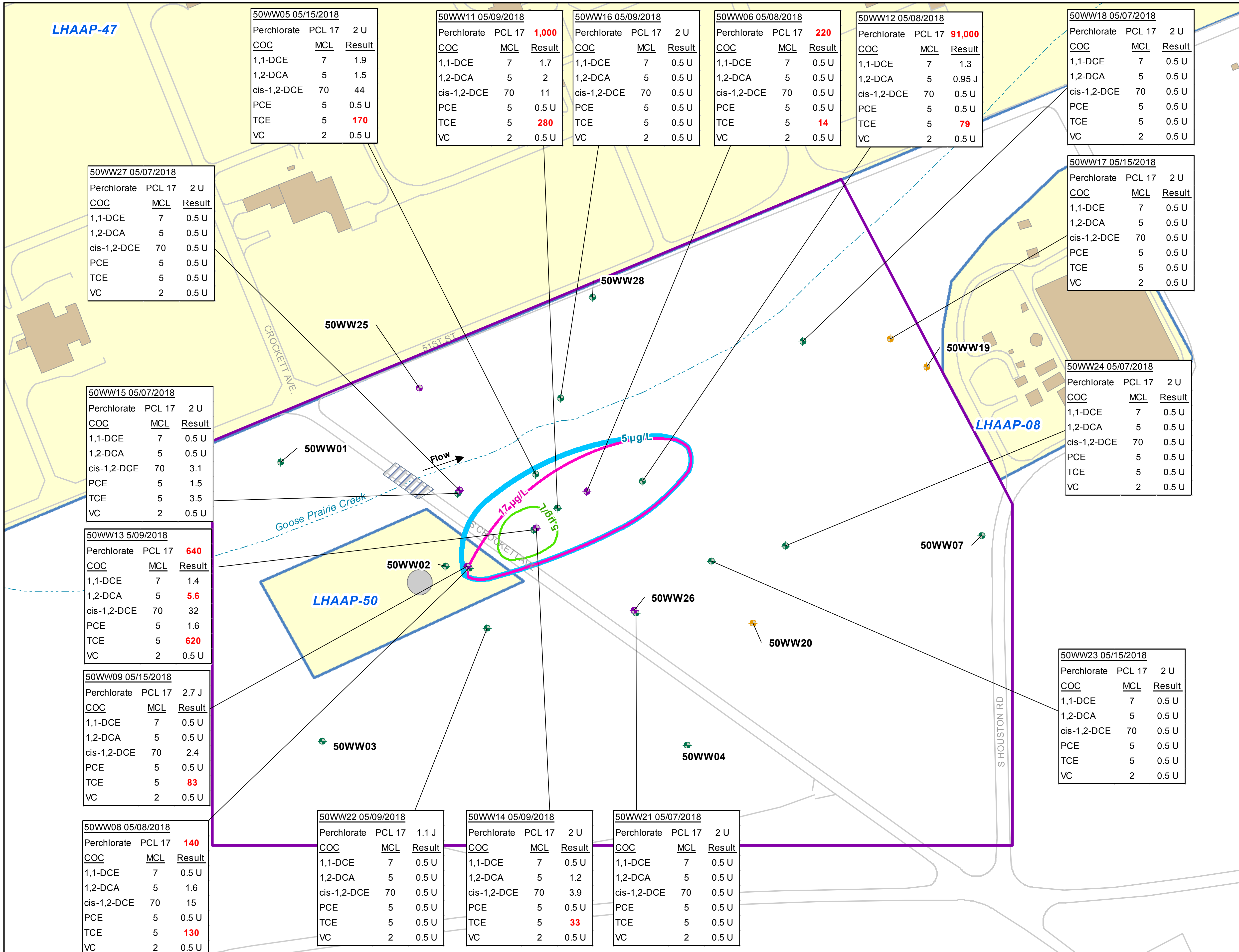
Attachment D
Typical DPT Temporary Injection Point Diagram

Longhorn Army Ammunition Plant
Karnack, Texas

Attachment E

COC Concentrations in Shallow Groundwater

- **Figure 1-5, COC Concentrations in Shallow Groundwater at LHAAP-50, RD/RAWP**



50WW05 05/15/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	1.9
1,2-DCA	5	1.5
cis-1,2-DCE	70	44
PCE	5	0.5 U
TCE	5	170
VC	2	0.5 U

50WW11 05/09/2018

COC	MCL	Result
Perchlorate	PCL 17	1,000
1,1-DCE	7	1.7
1,2-DCA	5	2
cis-1,2-DCE	70	11
PCE	5	0.5 U
TCE	5	280
VC	2	0.5 U

50WW16 05/09/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW06 05/08/2018

COC	MCL	Result
Perchlorate	PCL 17	220
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	14
VC	2	0.5 U

50WW12 05/08/2018

COC	MCL	Result
Perchlorate	PCL 17	91,000
1,1-DCE	7	1.3
1,2-DCA	5	0.95 J
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	79
VC	2	0.5 U

50WW18 05/07/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW27 05/07/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW17 05/15/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW15 05/07/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	3.1
PCE	5	1.5
TCE	5	3.5
VC	2	0.5 U

50WW24 05/07/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW13 5/09/2018

COC	MCL	Result
Perchlorate	PCL 17	640
1,1-DCE	7	1.4
1,2-DCA	5	5.6
cis-1,2-DCE	70	32
PCE	5	1.6
TCE	5	620
VC	2	0.5 U

50WW09 05/15/2018

COC	MCL	Result
Perchlorate	PCL 17	2.7 J
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	2.4
PCE	5	0.5 U
TCE	5	83
VC	2	0.5 U

50WW23 05/15/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW08 05/08/2018

COC	MCL	Result
Perchlorate	PCL 17	140
1,1-DCE	7	0.5 U
1,2-DCA	5	1.6
cis-1,2-DCE	70	15
PCE	5	0.5 U
TCE	5	130
VC	2	0.5 U

50WW22 05/09/2018

COC	MCL	Result
Perchlorate	PCL 17	1.1 J
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

50WW14 05/09/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	1.2
cis-1,2-DCE	70	3.9
PCE	5	0.5 U
TCE	5	33
VC	2	0.5 U

50WW21 05/07/2018

COC	MCL	Result
Perchlorate	PCL 17	2 U
1,1-DCE	7	0.5 U
1,2-DCA	5	0.5 U
cis-1,2-DCE	70	0.5 U
PCE	5	0.5 U
TCE	5	0.5 U
VC	2	0.5 U

- Lower Shallow Monitor Well
- Upper Shallow Monitor Well
- Fully Penetrating Shallow Monitor Well
- 1,2-DCA Contour
- Perchlorate Contour (*Dashed where inferred*)
- TCE Contour
- Goose Prairie Creek
- Roads
- Land Use Control Boundary
- Bridges
- Former Storage Tank Location
- Buildings
- Site Boundaries

Notes:
1. All concentrations are shown in micrograms per liter (µg/L).
2. 1,1-DCE = 1,1-dichlorothene
   1,2-DCA = 1,2-dichlorothane
   cis-1,2-DCE = cis-1,2-dichloroethene
   PCE = tetrachloroethene
   TCE = trichloroethene
   VC = vinyl chloride
   MCL = maximum concentration level
   PCL = protective concentration level
   U = below detection limit
   J = estimated value
   COC = contaminant of concern
3. Results in red are above the MCL or PCL.

0 75 150 Feet

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Figure 1-5
COC Concentrations in Shallow Zone, May 2018

Remedial Action Work Plan,
Contingency Remedy, LHAAP-50

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Attachment F

Not Applicable

Attachment G

Not Applicable

Attachment H

Safety Data Sheets

- **Electron Donor Solution (EDS-ER™)**

Material Safety Data Sheet

Electron Donor Solution

Section 1: Chemical Product and Company Identification

Product Name: Electron Donor Solution Extended Release
Catalog Codes: EDS-ER
CAS#: 8001-22-7
TSCA: TSCA 8(b) inventory: Soybean oil
HMIS Code: H F R P: 10 0 A
Trade Name and Synonyms: EDS-ER
Chemical Family: Glyceride Oils

Contact Information:
Tersus Environmental, LLC
109 E. 17th Street, Suite #3880
Cheyenne, WY 82001
Ph: 307.638.2822 • info@tersusenv.com
www.tersusenv.com
For emergency assistance, call: 919.638.7892

Section 2: Composition and Information on Ingredients

COMPONANT	CAS #	OSHA TWA	OSHA STEL	ACGIH TWA	ACGIH STEL
Soybean Oil	8001-22-7	---	10 mg/m^3	---	---
Vegetable Oil Derived Fatty Acid Esters	Confidential	---	---	---	---

HAZARDOUS INGREDIENTS: NONE AS DEFINED UNDER THE U.S. OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) OR THE CANADIAN HAZARDOUS PRODUCTS. ACT S.C. 1987, C.30 (PART 1).

THE PRECISE COMPOSITION OF THIS PRODUCT IS PROPRIETARY INFORMATION. A MORE COMPLETE DISCLOSURE WILL BE PROVIDED TO A PHYSICIAN IN THE EVENT OF A MEDICAL EMERGENCY.

SARA HAZARD: NONE NOTED (SECTION 311/312) TITLE III SECTION 313 - NOT LISTED
All components of this product are listed on the TSCA registry.

Section 3: Physical/Chemical Characteristics

BOILING RANGE: Not applicable VAPOR DENSITY: Exceeds 1.0

SPECIFIC GRAVITY (H20=1.0): 0.92 - 0.925 VAPOR PRESSURE: Not applicable

PERCENT VOLATILE BY VOLUME: 0% SOLUBILITY IN WATER: Miscible

EVAPORATION RATE: Not applicable
APPEARANCE AND ODOR: A pale yellow, oily liquid - only a faint odor.
WEIGHT PER GALLON: 7.7 lbs. at 60F.

Section 4: Fire and Explosion Data

FLAMMABILITY CLASSIFICATION: Combustible Liquid - Class IIIB.
FLASHPOINT: Greater than 550 F (288 C).
METHOD USED: Tag Closed Cup.
EXTINGUISHING MEDIA: CO_2, dry chemical, foam, sand.
SPECIAL FIREFIGHTING PROCEDURES: Avoid use of water as it may spread fire by dispersing oil. Use water to keep fire-exposed containers cool. Water spray may be used to flush spills away from fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Rags soaked with any oil or solvent can present a fire hazard and should always be stored in UL Listed or Factory Mutual approved, covered containers. Improperly stored rags can create conditions that lead to oxidation. Oxidation, under certain conditions can lead to spontaneous combustion.

Section 5: Reactivity Data

STABILITY: Generally stable. Spontaneous combustion can occur. See Unusual Fire and Explosion Procedures, Section IV.

CONDITIONS TO AVOID: High surface area exposure to oxygen can result in polymerization and release of heat.

INCOMPATABILITY (MATERIALS TO AVOID): Avoid contact with strong oxidizing agents.

HAZARDOUS DECOMPOSITIONS OR BY-PRODUCTS: Decomposition may produce carbon dioxide and carbon monoxide.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 6: Health Hazard Data

THRESHHOLD LIMIT VALUE: As a liquid - none. As oil mist - 10 mg/m3 total particulate.

INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: Excessive inhalation of oil mist may affect the respiratory system. Oil mist is classified as a nuisance particulate by ACGIH.

SKIN ABSORPTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: Not classified as a primary skin irritant or corrosive material. Sensitive individuals may experience dermatitis after long exposure of oil on skin.

HEALTH HAZARDS (ACUTE AND CHRONIC): Acute: none observed by inhalation. Chronic: none reported.

EMERGENCY AND FIRST AID PROCEDURES FOR:

SKIN CONTACT: May be removed from skin by washing with soap and warm water.

EYE CONTACT: Immediately flush eyes with plenty of cool water for at least 15 minutes. Do NOT let victim rub eyes.

INHALATION: Immediately remove exposed individual to fresh air source. If victim has stopped breathing give artificial respiration, get medical attention immediately.

Section 7: Precautions for Safe Handling and Use

ENVIRONMENTAL PRECAUTIONS: Where large spills are possible, a comprehensive spill response plan should be developed and implemented.

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Wear appropriate respiratory protection and protective clothing as described in section VIII. Depending on quantity of spill: (a) Small spill - add solid adsorbent, shovel into disposable container and wash the area. Clean area with detergent. (b) Large spill - Squeegee or pump into holding container. Clean area with detergent. In the event of an uncontrolled release of this material, the user should determine if this release is reportable under applicable laws and regulations.

WASTE DISPOSAL METHOD: All recovered material should be packaged, labeled, transported, and disposed or reclaimed in accordance with local, state, and federal regulations and good engineering practices.

Section 8: Control Measures

RESPIRATORY PROTECTION: Not normally needed. A qualified health specialist should evaluate whether there is a need for respiratory protection under specific conditions.

VENTILATION: Handle in the presence of adequate ventilation. Intermittent clean air exchanges recommended, but not required.

PROTECTIVE GLOVES: Not normally needed. However, protective clothing is always recommended when handling chemicals.

EYE PROTECTION: Eye protection is always recommended when handling chemicals. Wear safety glasses meeting the specifications established in ANSI Standard Z87.1.

Section 9: Special Precautions

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store away from flame, fire, and excessive heat.

Section 10: Disposal Considerations

General Information: Do not discharge into drains, watercourses or onto the ground. Discharge, treatment, or disposal may be subject to national, state, or local laws. Empty containers may contain product residues.

Disposal Methods: No specific disposal method required.

Container: Since emptied containers retain product residue, follow label warnings even after container is emptied.

Section 11: Transportation Information

DOT Not regulated.
TDG Not regulated.
IATA Not regulated.
IMDG Not regulated.

Section 12: Other Information

Hazard Ratings

	Health Hazard	Fire Hazard	Instability	Special Hazard
NFPA	1	1	0	NONE

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
NFPA Label colored diamond code: Blue - Health; Red - Flammability; Yellow - Instability; White - Special Hazards

	Health Hazard	Flammability	Physical Hazard	Personal Protection
HMIS	1	1	0	--

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
HMIS Label colored bar code: Blue - Health; Red - Flammability; Orange - Physical Hazards; White - Special

Section 13: Disclaimer and/or Comments

We suggest that containers be either professionally reconditioned for re-use by certified firms or properly disposed of by certified firms to help reduce the possibility of an accident. Disposal of containers should be in accordance with applicable federal, state and local laws and regulations. "Empty" drums should not be given to individuals.

The conditions of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Tersus Environmental be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Tersus Environmental has been advised of the possibility of such damages.

Safety Data Sheet

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: DHC microbial consortium (SDC-9)

Manufacturer Aptim 17 Princess Road, Lawrenceville, NJ 08648. Phone (609) 895-5340

CAS #: N/A (Not Applicable)

Product Use: For remediation of contaminated groundwater (environmental applications).

Material Description: Non-toxic, naturally occurring, non-pathogenic, non-genetically altered anaerobic microbes in a water-based medium.

IN CASE OF EMERGENCY CALL CHEMTREC 24 HOUR EMERGENCY RESPONSE PHONE NUMBER (800) 424-9300

SECTION 2 – COMPOSITIONS AND INFORMATION ON INGREDIENTS

Components	%	OSHA PEL	ACGIH TLV	OTHER LIMITS
Non-Hazardous Ingredients	100	N/A	N/A	N/A

Based on Microbial Insights QuantArray® analysis, the DHC microbial consortium (SDC-9) is comprised of microorganisms of the genera *Dehalococcoides, Desulfovibrio, Desulfitobacterium, Dehalobium, and Dehalobacter* as well as sulfate reducing bacteria and methanogenic archaebacteria.

SECTION 3 – HAZARDS IDENTIFICATION

The available data indicates no known hazards associated with exposure to this product. Nevertheless, individuals who are allergic to enzymes or other related proteins should avoid exposure and handling. Health effects associated with exposure to similar organisms are listed below.

Ingestion: Ingestion of large quantities may result in abdominal discomfort including nausea, vomiting, cramps, diarrhea, and fever.

Inhalation: Hypersensitive individuals may experience breathing difficulties after inhalation of aerosols.

Skin Absorption: May cause irritation upon prolonged contact. Hypersensitive individuals may experience allergic reactions.

Eye contact: May cause irritation unless immediately rinsed.

SECTION 4 – FIRST-AID MEASURES

Ingestion: Thoroughly rinse mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Get immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Inhalation: Get medical attention if allergic symptoms develop.

Skin Absorption: N/A

Skin Contact: Wash affected area with soap and water. Get medical attention if allergic symptoms develop.

Eye Contact: Flush eyes with plenty of water for at least 15 minutes using an eyewash fountain, if available. Get medical attention if irritation occurs.

NOTE TO PHYSICIANS: All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this material may have occurred.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammability of the Product: Non-flammable

Flash Point: N/A

Flammable Limits: N/A

Fire Hazard in Presence of Various Substances: N/A

Explosion Hazard in Presence of Various Substances: N/A

Extinguishing Media: Foam, carbon dioxide, water

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Reportable quantities (in lbs of EPA Hazardous Substances): N/A

No emergency results from spillage. However, spills should be cleaned up promptly. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. All personnel involved in the cleanup must wear protective clothing and avoid skin contact. After clean-up, disinfect all cleaning materials and storage containers that come in contact with the spilled liquid.

SECTION 7 – HANDLING AND STORAGE

Avoid breathing breathe aerosol. Avoid contact with skin. Use personal protective equipment recommended in Section 8.
Keep containers tightly closed in a cool, well-ventilated area. The DHC microbial consortium (SDC-9) is typically supplied in stainless steel kegs equipped with pressure relief valves. The kegs are pressurized with Nitrogen gas (N_2) up to the pressure of 15 psi. **Do not exceed pressure of 15 psi during transfer of DHC microbial consortium (SDC-9) from kegs.** Don't open keg if content of the keg is under pressure.

DHC microbial consortium (SDC-9) may be stored for up to 4 weeks at temperature
2-4°C without aeration. Avoid freezing.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Hand Protection: Rubber, nitrile, or vinyl gloves.

Eye Protection: Safety goggles or glasses with side splash shields.

Protective Clothing: Use adequate clothing to prevent skin contact.

Respiratory Protection: N95 respirator if aerosols might be generated.

Ventilation: Provide adequate ventilation to remove odors.

Other Precautions: An eyewash station in the work area is recommended.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical state and appearance: Light greenish murky liquid. Musty odor.

Boiling Point: 100°C (water)	Specific Gravity (H_2O = 1): 0.9 - 1.1
Vapor Pressure @ 25°C: 24 mm Hg (water)	Melting Point: 0°C (water)
Vapor Density: N/A	Evaporation Rate (H_2O = 1): 0.9 - 1.1
Solubility in Water: Soluble	Water Reactive: No
pH: 6.0 - 8.0	

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable

Conditions to Avoid: None

Incompatibility (Materials to Avoid): Water-reactive materials

Hazardous Decomposition Byproducts: None

SECTION 11 – TOXICOLOGICAL INFORMATION

This product contains no toxic ingredients.
SDC-9 consortium has tested negative for pathogenic microorganisms such as *Bacillus cereus*, *Listeria monocytogens*, *Salmonella* sp., Fecal Coliforms, Total Coliforms, Yeast and Mold and *Pseudomonas* sp.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity: this material will degrade in the environment.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Method: No special disposal methods are required. The material is compatible with all known biological treatment methods. To reduce odors and permanently inactivate microorganisms, mix 100 parts (by volume) of SDC-9 consortium with 1 part (by volume) of bleach. Dispose of in accordance with local, state and federal regulations.

SECTION 14 – TRANSPORT INFORMATION

DOT Classification:	N/A
Labeling:	NA
Shipping Name:	Not regulated

SECTION 15 – REGULATORY INFORMATION

Federal and State Regulations: N/A

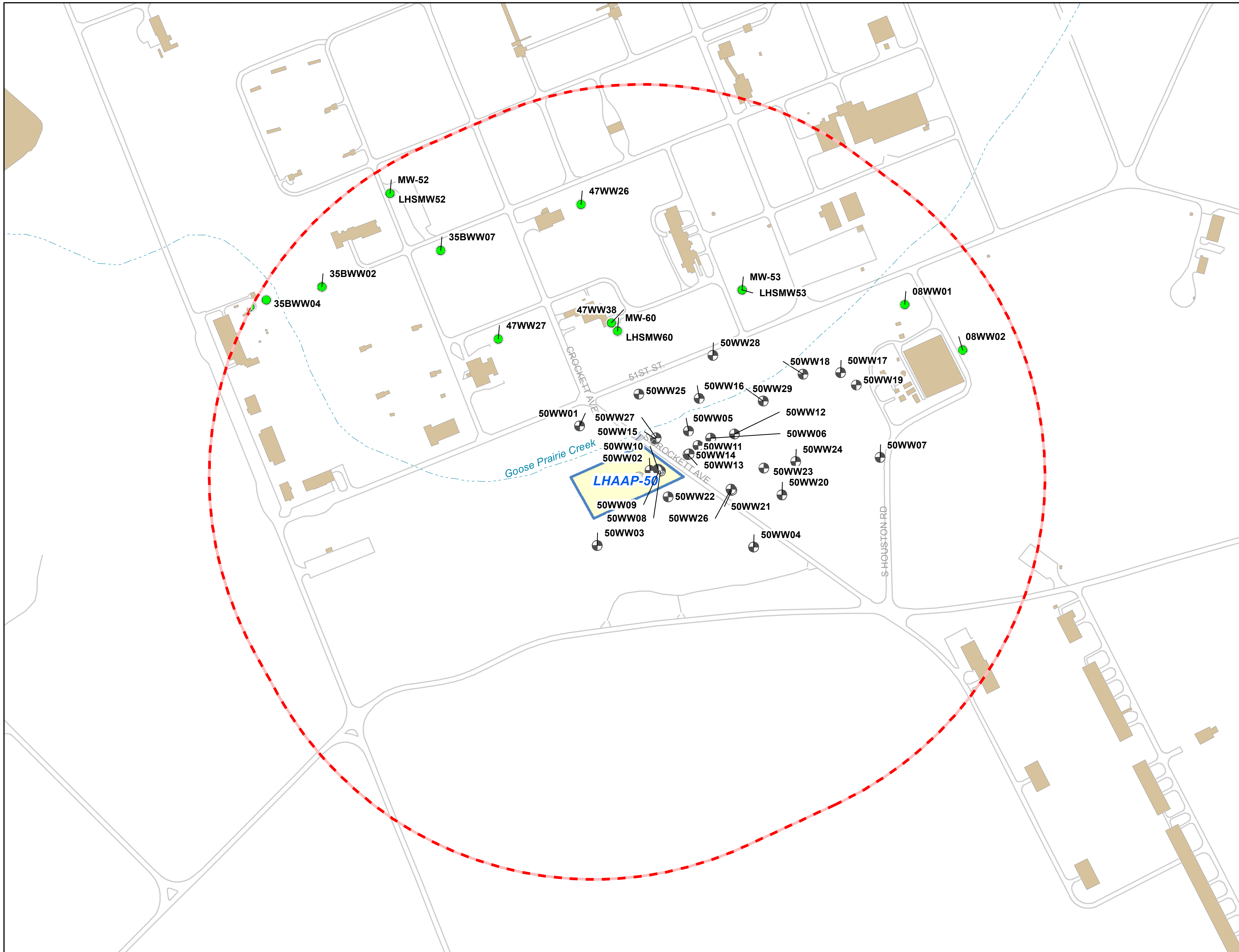
SECTION 16 – OTHER INFORMATION

MSDS Code: ENV 1033
MSDS Creation Date: 10/06/2003
Last Revised: March 15, 2019.

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, APTIM MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

Attachment I

Quarter Mile Radius Map and Boring Logs



U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate ENVIRONMENT & INFRASTRUCTURE

APTIM

Figure 1

Wells within ¼ Mile Radius
LHAAP-50

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

00954060

Hole No. 35BWW02(S)

DRILLING LOG

DIVISION: USACE Tulsa	INSTALLATION: LHAAP Karnack, TX	SHEET 1 OF 2 SHEETS	
PROJECT: LHAAP Site 35B	10. SIZE AND TYPE OF BIT: Hex K.F.		
LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
DRILLING AGENCY: GPI, Inc Houston, TX	12. MANUFACTURER'S DESIGNATION OF DRILL: CME-75 3 1/4" ID 2" ... HSA / 3" Long Sampler / 11" OD HSA		
HOLE NO. (As shown on drawing title and file number): 35BWW02	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED: 12	UNDISTURBED: —
NAME OF DRILLER: José Landros	14. TOTAL NUMBER CORE BOXES: NA		
DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER: —		
	16. DATE HOLE	STARTED: 8-31-98	COMPLETED: 8-31-98
THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE: —		
DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING: NA %		
TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR: BB		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–3	CL	silty clay - red to gray red some lt brown (mottled) stiff to very stiff - (Dry)	3.5' of 4.0'	SS#1 0.0' to 4.0'	Commenced @ 1325 Hex Rods Sampler = 0ppm
	3–5	CL	silty clay - lt gray to lt brown w/ some orange staining (mottled) (stiff & friable) (Dry)			
	5–10.5	SM	silty sand - lt gray sand w/ high silt content low plasticity soft and friable throughout (Dry) high fine content from 7' to 8' fines increase again from 8' down to ... grades into CL at 10.5'	5.0' of 5.0'	SS#2 4.0' to 9.0'	Sampler =
	10.5–12	CL	silty clay - gray to lt gray w/ orange staining (mottled) moderate plasticity (moist)	5.0' of 5.0'	SS#3 9.0' to 14.0'	Sampler = 4ppm
	12–14	SM	silty sand/sandy silt - gray to dark gray silty sand / no plasticity soft to very soft (free water) grades into CL around 14 to 14.1'			
	14–15	CL	silty sandy clay - med gray to lt gray w/ orange staining (moist) thin layer of hard shale like clay about 2" thick			
	15–18	SP	poorly sorted sand - lt gray to gray sand w/ some silt no plasticity very soft some orange staining (free water)	2.5' of 5.0'	SS#4 14.0' to 19.0'	
	19–			2.0' of 4.0'	SS#5 19.0' to 21.0'	

000164

HOLE NO.

00954061

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE				Hole No. 35BW002	
PROJECT			INSTALLATION		SHEET 2 OF 2 SHEETS	
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	20	SM	silty sand - orange-brown to lt gray (mottled) silty sand w/some gravel around 20.2' (soft to stiff) no plasticity (wet)	2.0' of 2.0'	SS#5 19.0' to 21.0'	
	21–23	SM/SC	silty clayey sand - lt gray to orange brown - sand with lots of fines (some plasticity) soft to very soft (free water)	2.0' to 2.0'	SS#6 21.0' to 23.0'	
	23–25	SM	silty sand - lt gray to lt brown silty sand no plasticity very soft (free wat)	5.0' of 2.0'	SS#7 23.0 to 25.0	
	25–27	SM	as above	2.0' of 2.0'	SS#8 25.0 to 27.0	
	27–29			2.0' of 2.0'	SS#9 27.0 to 29.0'	
	28	SM	As above			
	29–34			5.0' of 5.0'	SS#10 29.0' to 34.0'	
	33	SM/SC	silty clayey sand - lt gray to lt brown w/a purple tint soft + (free wat)			clayey sand - gravel w/appreciable amount of sandy silt "shale" clayey Dark brown to lt gray to orange (wet) stiff but friable SP -68
	35	SM	silty sand lt brown n. sand w/some fines increase towards bottom (soft free wat)	5.0' of 5.0'	SS#11 34.0' to 39.0'	
	39	SM	As above free wat	5.0' of 5.0'	SS#12 39.0' 44.0	
	42	CL	thin clay layer - (med stiff to stiff) lt gray clay - (wet)			
		SM	lt gray silty sand - soft + free wat no plasticity			

Right-edge marks: 44, 45, 46, 47

000105

PROJECT	HOLE NO.

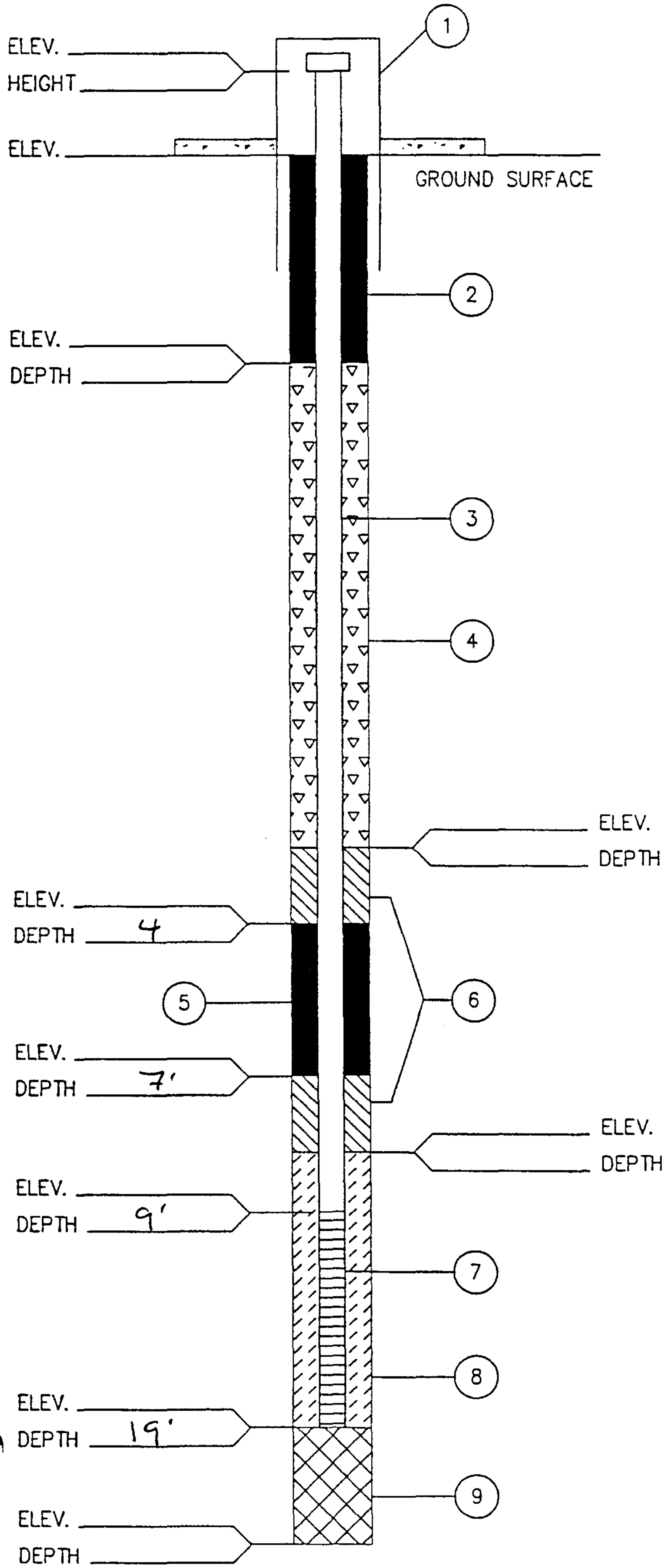
Hole No. 47WW26

00954062

DRILLING LOG	DIVISION USACE-Tulsa	INSTALLATION LHAAP-Karnack, TX	SHEET 1 OF 1 SHEETS
1. PROJECT LHAAP Supplemental RI Site 47		10. SIZE AND TYPE OF BIT Auger Bits	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY ETTL - Tyler, TX		12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B-51 / 5' Cont. sampler	
4. HOLE NO. (As shown on drawing title and file number) 47WW26		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4; UNDISTURBED 0	
5. NAME OF DRILLER Tom Cook		14. TOTAL NUMBER CORE BOXES N/A	
		15. ELEVATION GROUND WATER	
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED ___ DEG. FROM VERT.		16. DATE HOLE: STARTED 12-2-00; COMPLETED 12-2-00	
7. THICKNESS OF OVERBURDEN Penetrated 19.0'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK N/A		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 19.0' below grade		19. SIGNATURE OF INSPECTOR [signature] PG	

ELEVATION a	DEPTH (ft.) b	USC LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–4	CL	Silty Clay Lt. gray and brown with some Lt. to dark orange-brown mottling, trace roots and fine sand - Moist (stiff)	3.3/4.0'	SS #1 0.0' to 4.0'	1038 Commenced HSA pilot hole w/ 4¼" I.D. HSA. HNU-PID - 10.2eV Lamp. HNu Reading in Sampler = 0ppm. HNu Reading @ Augers = 0ppm. Ambient air = 0ppm
	4–9		Silty Clay Lt. gray, brown and reddish-brown (mottled) with some dark rust colored streaking and staining, plastic, trace to some fine sand throughout sample - Damp to Moist (v. stiff)	4.9/5.0	SS #2 4.0' to 9.0'	HNu Reading in Sampler = 0ppm. HNu Reading @ augers = 0ppm. Ambient air = 0ppm
	9–14		Silty Clay - Lt. gray, brown, yellow-brown, and some dark orange-brown - mottled and horiz. layered v. thin bedded, occ. some small (¼") block incl., trace to some fine sand throughout sample - Moist (stiff)	5.0/5.0'	SS #3 9.0' to 14.0'	HNu Reading in Sampler = 0ppm. HNu Reading @ Augers = 0ppm. No obvious odors in samples. Ambient air = 0ppm
	14–19	SM / SP / CL	Sandy Silt - Lt. to med. gray with some orange and yellow-brown mottling, fine grained sand, some sl. clayey - Wet / Saturated. Grading into fine sand (Wet) @ 16.7'. Silty Clay Lt. brown, gray and blue-gray - mottled, plastic, trace to some fine sand - Damp to Moist (v. stiff)	5.0/5.0'	SS #4 14.0' to 19.0'	HNu Reading in sampler = 0ppm. HNu Reading @ Augers = 0ppm. 1120 Commenced overdrilling pilot hole w/ 11" O.D. HSA ("plugged") for 4" SS well construction. - Bent./cement grout 4' to grade. - Bent. seal 7' to 4'. - Sand filterpack (20-40) 19' to 7'. - 4" SS (304) #10 slot screen 19' to 9'
	19		T.D. @ 19' below grade in Damp, plastic silty clay			T.D. @ 19.0' in silty clay

00954063



MONITORING WELL CONSTRUCTION INFORMATION

JOB. NO. C5018700

BORING/WELL NO. 47WW26

DATE 12-2-00

CHIEF UNIT Wilcox

1. PROTECTIVE CASING YES NO

LOCKING YES NO

2. TYPE OF SURFACE SEAL (IF INSTALLED)

bentonite

3. SOLID PIPE TYPE 304 S.S.

SOLID PIPE LENGTH 9 ft.

JOINT TYPE SLIP/GLUED/THREADED

4. TYPE OF BACKFILL cement/bentonite

HOW INSTALLED – TREMIE

FROM SURFACE

5. TYPE OF LOWER SEAL (IF INSTALLED)

bentonite chip

6. TYPE OF SECONDARY FILTER PACK

NA

7. SCREEN TYPE 304 S.S.

SCREEN LENGTH 10 ft.

SLOT SIZE #10 Wire Wound in.

SCREEN DIAMETER 4" I.D. in.

8. TYPE OF PRIMARY FILTER PACK

20-40 Silica Sand

9. TYPE OF BACKFILL

10. DRILLING METHOD HSA

WATER LEVEL ______ DATE ______

*ALL DEPTHS MEASURED FROM GROUND SURFACE

JACOBS ENGINEERING

Hole No. 47WW27

00954064

DRILLING LOG	DIVISION USACE - Tulsa	INSTALLATION LHAAP - Karnack, TX	SHEET 1 OF 2 SHEETS

1. PROJECT: LHAAP Supplemental RI Site 47	10. SIZE AND TYPE OF BIT: Auger Bits
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY: ETTL - Tyler, TX	12. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-51 / SS = Soil Sample, 5' Cont. Sampler
4. HOLE NO. (As shown on drawing title and file number): 47WW27	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 4 / UNDISTURBED 0
5. NAME OF DRILLER: Tom Cook	14. TOTAL NUMBER CORE BOXES: N/A
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 11-30-00 / COMPLETED 11-30-00
7. THICKNESS OF OVERBURDEN: Penetrated 19.0'	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: N/A %
9. TOTAL DEPTH OF HOLE: 19.0' below grade	19. SIGNATURE OF INSPECTOR: [signature] PG

ELEVATION a	DEPTH (ft) b	USC LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–4	CL	3" of gravelly top soil with grass roots over Silty Clay Lt. to med. brown, Lt. gray, tan, and orange-brown mottled, streaked, and stained, some fine sand throughout, plastic - Moist (stiff)	3.2'/5.0'	SS #1 0.0 to 4.0	1420 Commenced HSA pilot hole c 4¼" I.D. Augers. HNu calib. to isobutyl. (10.2 eV Lamp). HNu Reading in Sampler: 0ppm. HNu Reading @ Augers: 0ppm
	4–9	CL	Silty Clay - Lt. brown, Lt. gray, and tan with some dark orange-brown and dark rust colored inclusions and staining throughout sample, plastic, trace to some fine sand throughout - Moist (V. stiff)	5.0'/5.0'	SS #2 4.0' to 9.0'	Ambient air = 0ppm. HNu Reading in Sampler = 0ppm. HNu Reading @ Augers = 0ppm. Ambient air = 0ppm
	9–14	CL	Silty Clay - Lt. gray, tan, and orange-brown mottled, silt and sand content inc. slightly c depth, plastic - Moist (stiff)	5.0'/5.0'	SS #3 9.0' to 14.0'	HNu Reading in sampler = 0ppm. HNu Reading @ Augers: 0ppm. Ambient Air = 0ppm
	14–19	SM / SP / SM / CL	Silty Sand - Lt. orange-brown and gray - mottled, V. fine to fine grained sand, poorly sorted - Wet/Saturated (Loose). Sand - Lt. gray and tan, v. fine to fine grained, some silt, poorly sorted - Wet/Saturated (Loose) Grading in silty sand @ 17.0'. - Silty clay - Lt. to med. gray and tan - mottled, trace to some fine sand, plastic - Damp (V. stiff). T.D. @ 19.0' in silty clay	5.0'/5.0'	SS #4 14.0' to 19.0'	Water in augers @ 14.0' from SM material. HNu Reading in Sampler: 2ppm. HNu Reading @ Augers = 0ppm. Ambient Air = 0ppm

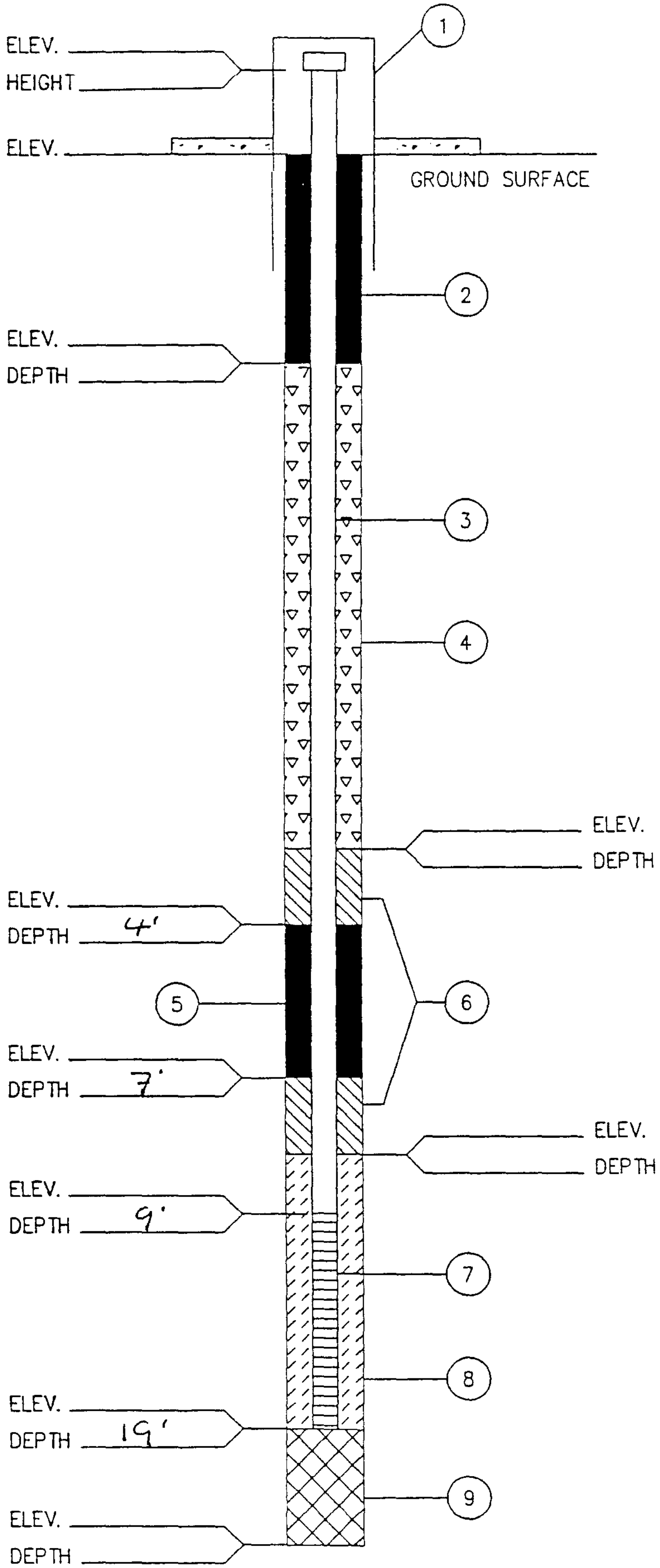
ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT LHAAP HOLE NO. 47WW27

00954065

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE	Hole No. 47WW27
PROJECT LHAAP Supplemental RI Site 47	INSTALLATION LHAAP - Karnack TX	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						1520 Commenced Overdrilling pilot hole with 11" O.D. HSA - "plugged" lead auger - for 4" SS Monitor well installation
						-
						- Bent. seal 7' to 4'
						- Filterpack sand (20-40) 19' to 7'
						- 4" SS (304) #10 slot screen 19' - 9'
						T.D. @ 19.0' below grade in Damp silty Clay

ENG FORM 1836-A JUN 67 (ER 1110-1-1801) GPO 1980 OF - 628 - 603 PROJECT LHAAP HOLE NO. 47WW27



MONITORING WELL CONSTRUCTION INFORMATION

JOB. NO. C5018700

BORING/WELL NO. 47WW27

DATE 11-30-00

CHIEF UNIT Wilcox

1. PROTECTIVE CASING <u>YES</u> NO

   LOCKING <u>YES</u> NO

2. TYPE OF SURFACE SEAL (IF INSTALLED) bentonite

3. SOLID PIPE TYPE 304 S.S.

   SOLID PIPE LENGTH 9 ft.

   JOINT TYPE SLIP/GLUED/<u>THREADED</u>

4. TYPE OF BACKFILL Cement/bentonite

   HOW INSTALLED – TREMIE

   <u>FROM SURFACE</u>

5. TYPE OF LOWER SEAL (IF INSTALLED) bentonite chip

6. TYPE OF SECONDARY FILTER PACK NA

7. SCREEN TYPE 304 S.S.

   SCREEN LENGTH 10 ft.

   SLOT SIZE #10 Wire Wound in.

   SCREEN DIAMETER 4" I.D. in.

8. TYPE OF PRIMARY FILTER PACK 20-40 Silica Sand

9. TYPE OF BACKFILL

10. DRILLING METHOD HSA

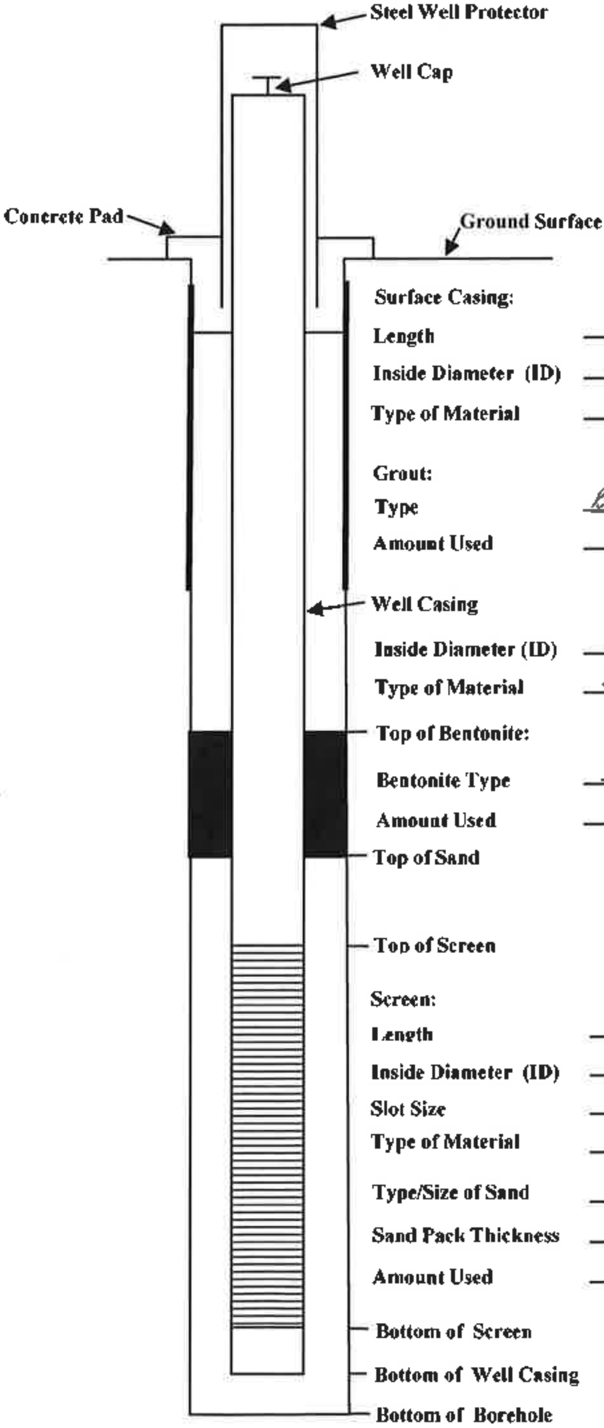
WATER LEVEL ______ DATE ______

*ALL DEPTHS MEASURED FROM GROUND SURFACE

JACOBS ENGINEERING

AECOM		
Client: USACE		WELL ID: ~~50WWAT~~ 50WW08
Project Number: 60251135		
Site Location: Site 50		Date Installed: 8/22/13
Well Location:	Coords:	Borehole Diameter: 8"
Method: HSA		Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/Portland	8/22/13
Amount Used		14.7 Gals
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		10'
Bentonite Type	3/8" Chips	
Amount Used	1.5 50lb Bags	
Top of Sand		13'
Top of Screen		14.6'
Screen:		
Length	14.1'	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness	17	
Amount Used	10 x 50lbs bags	
Bottom of Screen		29.2'
Bottom of Well Casing		29.75'
Bottom of Borehole		30'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

STATE OF TEXAS WELL REPORT for Tracking #345178

Owner:	**USACE**	Owner Well #:	**50WW08**
Address:	**Hwy 43** **Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43** **Karnack , TX 75670**	Latitude:	**32° 40' 40" N**
Well County:	**Harrison**	Longitude:	**094° 08' 24" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 30 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 10 ft with Grout (#sacks and material)** 3rd Interval: **From 10 ft to 13 ft with Bentonite (#sacks and material)** Method Used: **Gravity** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**

Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**

Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services** **4647 Brass Way** **Dallas , TX 75236**
Driller License Number:	**54611**

00954068

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345178**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 6.5 Yellow Brown Silty Clay
6.5 to 8 Tan Silty Sand
8 to 14.5 Tan and Gray Silty Clay
14.5 to 30 Tan and Gray Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/15 Sched. 40
2 New PVC Screen 15/30 0.010 Slotted

00954069

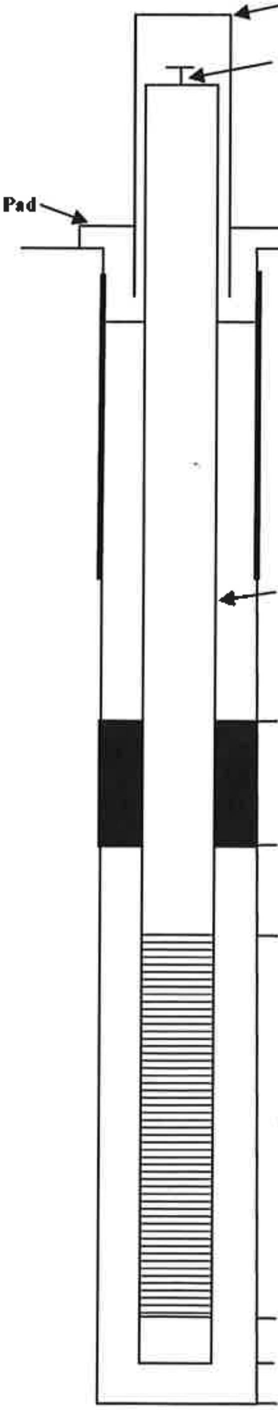
D-3

00321783

AECOM	Client: USACE	WELL ID: ~~SDWW12~~ 50WW09
	Project Number: 60256135	
	Site Location: Site 50	Date Installed: 8/22/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Surface Casing:
Length ______
Inside Diameter (ID) ______
Type of Material ______

Grout:
Type: Bentonite/Portland
Amount Used ______

8/22/13
35.7 Gals
35.7 Gals
8/23/13
12.6 Gals

Well Casing
Inside Diameter (ID): 2"
Type of Material: SCH 40 PVC

Top of Bentonite: 40'
Bentonite Type: ~~3/8~~" Chips
Amount Used: 1 x 50lb bag
Top of Sand: 43'

Top of Screen: 44.4'

Screen:
Length: 14.1'
Inside Diameter (ID): 2"
Slot Size: 0.010"
Type of Material: SCH 40 PVC

Type/Size of Sand: 20/40
Sand Pack Thickness: 17'
Amount Used: ~~[illegible]~~ 50lb. ~~Bags~~ Bags 8.75

Bottom of Screen: 58.9'
Bottom of Well Casing: 59.5'
Bottom of Borehole: 60'

Borehole Diameter: 8"

Comments: 1' to 1.5' cave-in in borehole around screen.

Installation Observed By: M. Law

00954070

STATE OF TEXAS WELL REPORT for Tracking #345179

Owner:	**USACE**	Owner Well #:	**50WW09**
Address:	**Hwy 43** **Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43** **Karnack , TX 75670**	Latitude:	**32° 40' 40" N**
Well County:	**Harrison**	Longitude:	**094° 08' 24" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 60 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 40 ft with Grout (#sacks and material)** 3rd Interval: **From 40 ft to 43 ft with Bentonite (#sacks and material)** Method Used: **Gravity** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services** **4647 Brass Way** **Dallas , TX 75236**
Driller License Number:	**54611**

00954071

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345179**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft)	Description
0 to 6.5	**Yellow Brown Silty Clay**
6.5 to 8	**Tan Silty Sand**
8 to 14.5	**Tan and Gray Silty Clay**
14.5 to 30	**Tan and Gray Silty Sand**
30 to 60	**Gray Fine Sand**

CASING, BLANK PIPE & WELL SCREEN DATA

Dia.	New/Used	Type	Setting From/To
2	**New**	**PVC Riser**	**0/45 Sched. 40**
2	**New**	**PVC Screen**	**45/60 0.010 Slotted**

00954072

D-6

00321786

50WW10

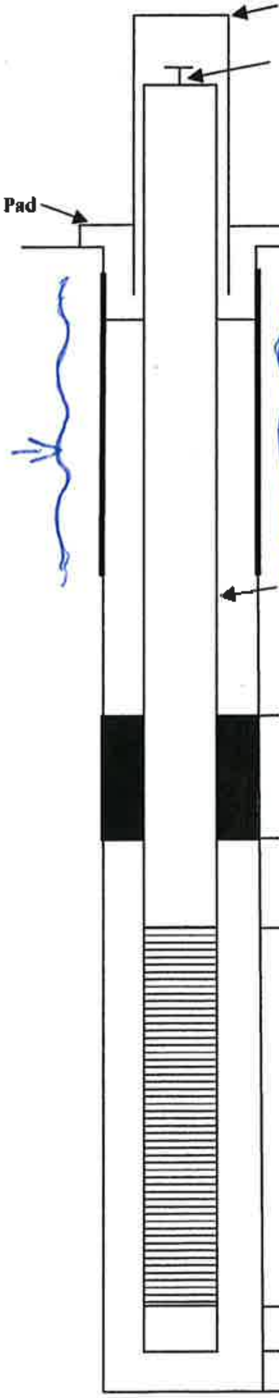
AECOM	Client: USACE	WELL ID: ~~50WW~~ A3
	Project Number: 60256135	Date Installed: 8/20/13
	Site Location: Site 50	
	Well Location: Coords:	Borehole Diameter: 10" / 8.25" / 5.5" (64' 65.5' 110')
	Method: HSA / Wash Rotary	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Date Surface Casing: 8-11-13

well completion: 8-20-13



Surface Casing:
- Length: 64'
- Inside Diameter (ID): 6.0-in
- Type of Material: Sch 40 PVC

Grout:
- Type: Portland/Bentonite
- Amount Used: 8-11-13 - 100 gal / 8 Bags. 8-12-13 40 gal 8-21-13 141 Gal.

Well Casing
- Inside Diameter (ID): 2.0-IN
- Type of Material: SCH 40 PVC

Top of Bentonite: 92'
- Bentonite Type: 3/8 coated pellets
- Amount Used: 2.5 Gals

Top of Sand: 97'

Top of Screen: 98.9' ML

Screen:
- Length: 9.55'
- Inside Diameter (ID): 2"
- Slot Size: 0.010"
- Type of Material: SCH 40 PVC
- Type/Size of Sand: 20/40
- Sand Pack Thickness: 12'
- Amount Used: 3.25 Bags (50lbs)

Bottom of Screen: 108.4'

Bottom of Well Casing: 109'

Bottom of Borehole: 110'

Borehole Diameter: 10" to 64' / 8.25" to 65.5' / 5.5" to 110'

Comments: centralizer @ 50', 96', +/109'

Installation Observed By: M. Hartford / M. Lew

D-7

00954073

00321787

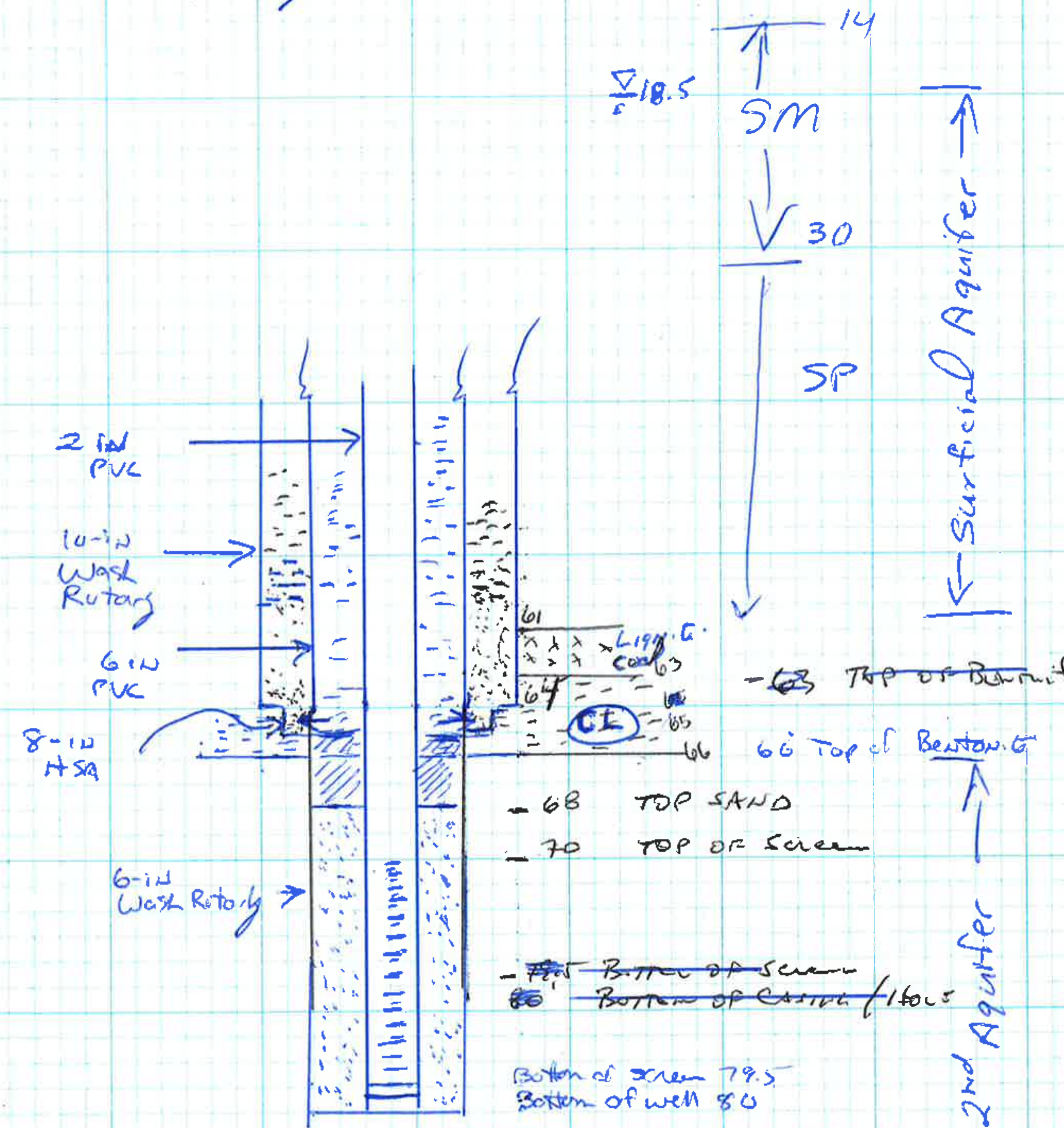
DMJM Harris | DMJM HARRIS | AECOM

JOB TITLE S.G 50

JOB NO. ____ CALCULATION NO. ____ ORIGINATOR Mark Hartford DATE 8-11-13

SHEET ____ OF ____ REVIEWER ____ DATE ____

Well ~~50WWA3~~ 50WWID



00954074

D-8

STATE OF TEXAS WELL REPORT for Tracking #345187

Owner:	**USACE**	Owner Well #:	**50WW10**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 40" N**
Well County:	**Harrison**	Longitude:	**094° 08' 24" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **10 in From Surface To 64 ft** Diameter: **6 in From 64 ft To 112 ft**
Drilling Method:	**Mud Rotary**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 92 ft with Grout (#sacks and material)** 3rd Interval: **From 92 ft to 97 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**

Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**

Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License	**54611**

00954075

D-9

Number:	
Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

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Please include the report's Tracking number (Tracking #**345187**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 6.5 Yellow Brown Silty Clay
6.5 to 8 Tan Silty Sand
8 to 14.5 Tan and Gray Silty Clay
14.5 to 30 Tan and Gray Silty Sand
30 to 60 Gray Fine Sand
60 to 63 Lignite
63 to 70 Brown Clay
70 to 72 Lignite
72 to 76 Gray Silty Clay
76 to 85 Lignite
85 to 92 Gray Sandy Clay
92 to 100 Gray Clay
100 to 110 Gray Sand
110 to 112 Gray Clay

CASING, BLANK PIPE & WELL SCREEN DATA

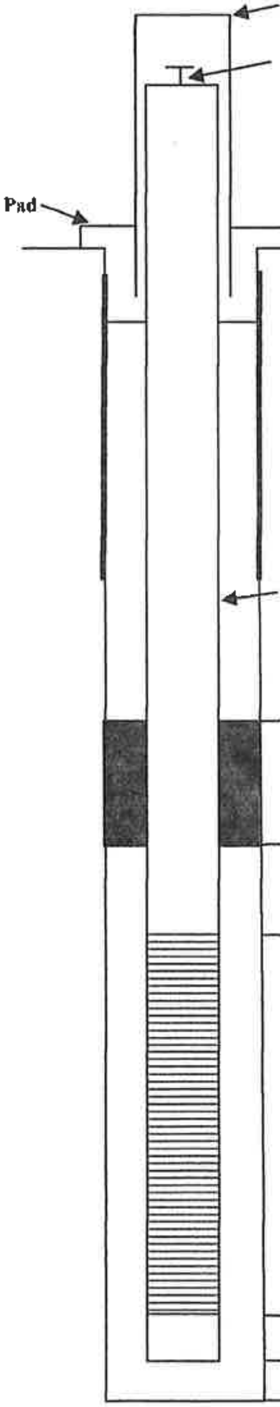
Dia. New/Used Type Setting From/To
6 New PVC Casing 0/64 Sched. 40
2 New PVC Riser 0/99 Sched. 40
2 New PVC Screen 99/109 0.010 Slotted

00954076

D-10

AECOM	Client: USACE	WELL ID: ~~50MW-8~~ 50WW11
	Project Number: 60256135	
	Site Location: ~~S~~ Site 50	Date Installed: 8/26/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Steel Well Protector

Well Cap

Concrete Pad

Ground Surface

Surface Casing:
- Length ______
- Inside Diameter (ID) ______
- Type of Material ______

Grout:
- Type: Bentonite/Portland — 8/25/13 25.2 Gals
- Amount Used ______

Well Casing
- Inside Diameter (ID): 2
- Type of Material: SCH 40 PVC

Top of Bentonite: 15'
- Bentonite Type: 3/8" chips
- Amount Used: 1.5 x 50lb bags

Top of Sand: 18'

Top of Screen: 20.2'

Screen:
- Length: 14.1
- Inside Diameter (ID): 2"
- Slot Size: 0.010"
- Type of Material: SCH 40 PVC
- Type/Size of Sand: 20/40
- Sand Pack Thickness: 17.3'
- Amount Used: 9.5 x 50lb Bags

Bottom of Screen: 34.7'

Bottom of Well Casing: 35.3'

Bottom of Borehole: 35.3'

Borehole Diameter: 8"

Comments: ______

Installation Observed By: M. Law

STATE OF TEXAS WELL REPORT for Tracking #345193

Owner:	**USACE**	Owner Well #:	**50WW11**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 41" N**
Well County:	**Harrison**	Longitude:	**094° 08' 22" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954078

D-12

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

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Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 1 Brown Silt
1 to 9 Brown Gray Red Silty Clay
9 to 10 Gray Silt
10 to 35 Brown Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

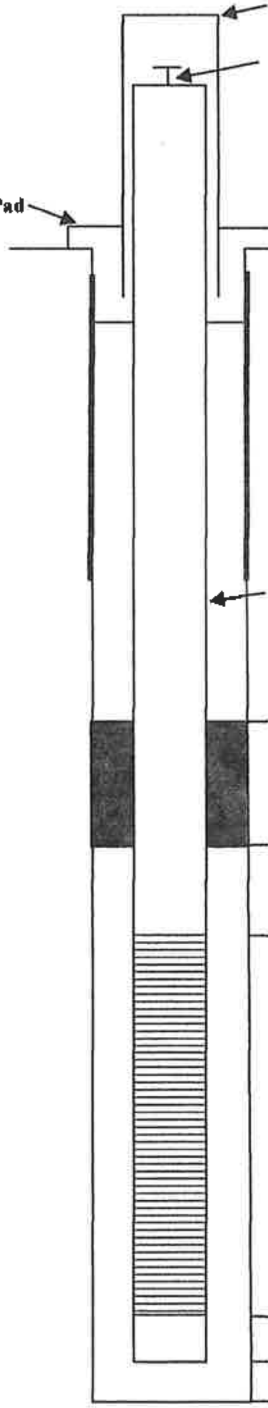
00954079

D-13

50WW12

AECOM	Client: USACE		WELL ID: ~~50WWC~~
	Project Number: 60256135		
	Site Location: Site 50		Date Installed: 8/25/12
	Well Location:	Coords:	Borehole Diameter: 8"
	Method: HSA		Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Steel Well Protector

Well Cap

Concrete Pad

Ground Surface

		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/Portland	8/25/13
Amount Used		29.4 Gals
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		15'
Bentonite Type	3/8" Chips	
Amount Used	1.5 Bags 50lb	
Top of Sand		18'
Top of Screen		20.1'
Screen:		
Length	14.1	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness	16.6"	
Amount Used	9.75 x 50lbs bags	
Bottom of Screen		34.6'
Bottom of Well Casing		35.2'
Bottom of Borehole		35.2'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

00954080

STATE OF TEXAS WELL REPORT for Tracking #345195

Owner:	**USACE**	Owner Well #:	**50WW12**
Address:	**Hwy 43** **Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43** **Karnack , TX 75670**	Latitude:	**32° 40' 42" N**
Well County:	**Harrison**	Longitude:	**094° 08' 20" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services** **4647 Brass Way** **Dallas , TX 75236**
Driller License Number:	**54611**

00954081

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 1 Brown Silt
1 to 9 Brown Gray Red Silty Clay
9 to 10 Gray Silt
10 to 35 Brown Silty Sand

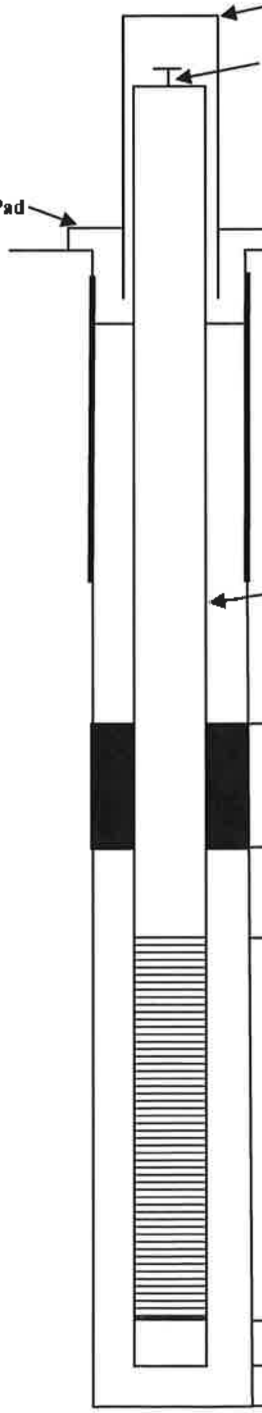
CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

AECOM

Client: USACE		WELL ID: ~~50WW01~~ 50WW13
Project Number: 60256135		
Site Location: Site 50		Date Installed: 8/28/13
Well Location:	Coords:	Borehole Diameter: 8"
Method: HSA		Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Surface Casing:
Length ______
Inside Diameter (ID) ______
Type of Material ______

Grout:
Type Bentonite/Portland — 8/28/13
Amount Used ______ — 31.6 Gals

Well Casing
Inside Diameter (ID) 2"
Type of Material SCH 40 PVC

Top of Bentonite: 15'
Bentonite Type 3/8" chips
Amount Used 1.5 x 50lb bags
Top of Sand 18'

Top of Screen 20'

Screen:
Length 14.1
Inside Diameter (ID) 2"
Slot Size 0.010"
Type of Material SCH 40 PVC
Type/Size of Sand 20/40
Sand Pack Thickness 14.5
Amount Used 10x 50lb Bags

Bottom of Screen 34.5'
Bottom of Well Casing 35.1'
Bottom of Borehole 35.1'

Borehole Diameter: 8'

Comments:

Installation Observed By: M. Law

00954083

STATE OF TEXAS WELL REPORT for Tracking #345198

Owner:	**USACE**	Owner Well #:	**50WW13**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 41" N**
Well County:	**Harrison**	Longitude:	**094° 08' 22" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954084

D-18

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345198**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 2 Brown Silty Sand
2 to 9 Brown Gray Red Silty Clay
9 to 10 Red Brown Clayey Sand
10 to 35 Brown Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

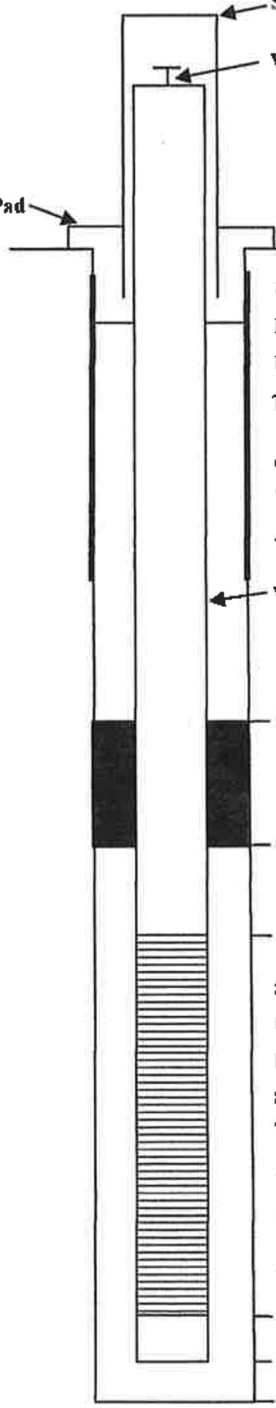
Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

00954085

00321799

AECOM	Client: USACE	WELL ID: ~~50WW02~~ 50WW14
	Project Number: 60256135	
	Site Location: Site 50	Date Installed: 8/27/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Steel Well Protector

Well Cap

Concrete Pad

Ground Surface

		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/Portland	8/28/13
Amount Used		39.9
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		39'
Bentonite Type	3/8" chips	
Amount Used	1.~~0~~ Bags (50 lb)	
Top of Sand		41'
Top of Screen		43.4'
Screen:		
Length	14.1'	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness	19' (*)	
Amount Used	11.5 x 50 lb Bags	
Bottom of Screen		57.9'
Bottom of Well Casing		58.5'
Bottom of Borehole		64.5'

Borehole Diameter: 8"

Comments: (*) Backfill Borehole w/ Bentonite pellets to 60' bgs.

Installation Observed By: M. Law

D-20

00954086

STATE OF TEXAS WELL REPORT for Tracking #345200

Owner:	**USACE**	Owner Well #:	**50WW14**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 41" N**
Well County:	**Harrison**	Longitude:	**094° 08' 22" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 60 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 39 ft with Grout (#sacks and material)** 3rd Interval: **From 39 ft to 41 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954087

D-21

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345200**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 2 Brown Silty Sand
2 to 9 Brown Gray Red Silty Clay
9 to 10 Red Brown Clayey Sand
10 to 60 Brown Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

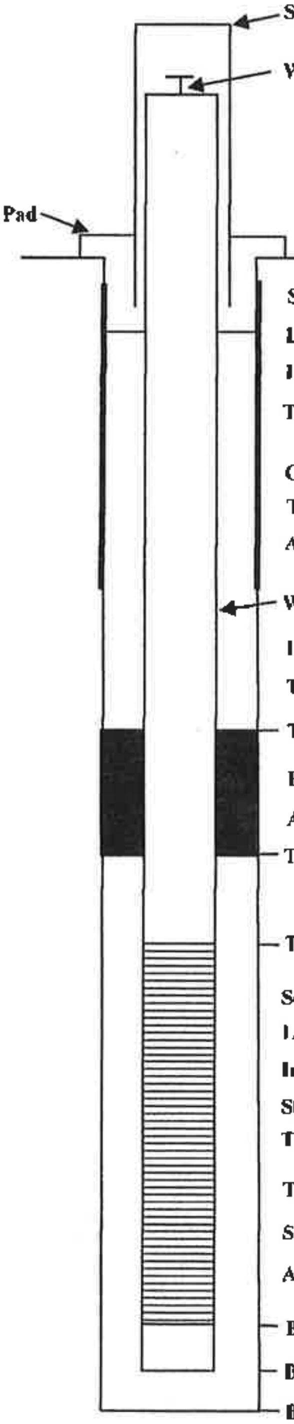
Dia. New/Used Type Setting From/To
2 New PVC Riser 0/43 Sched. 40
2 New PVC Screen 43/58 0.010 Slotted

00954088

D-22

AECOM	Client: USACE	WELL ID: ~~50WWE~~ 50WW15
	Project Number: 60256135	
	Site Location: Site 50	Date Installed: 9/9/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Steel Well Protector

Well Cap

Concrete Pad

Ground Surface

		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/Portland	9/9/13
Amount Used		31.5 Gals
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		15'
Bentonite Type	3/8" Chips	
Amount Used	1.5 x 50lb Bags	
Top of Sand		18'
Top of Screen		19.9'
Screen:		
Length	14.1'	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness		
Amount Used	8 x 50lb bags	
Bottom of Screen		34.4
Bottom of Well Casing		35.0
Bottom of Borehole		35.0

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

00954089

STATE OF TEXAS WELL REPORT for Tracking #345202

Owner:	**USACE**	Owner Well #:	**50WW15**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 41" N**
Well County:	**Harrison**	Longitude:	**094° 08' 24" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**

Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**

Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954090

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345202**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 5 Brown Silty Sand
5 to 14 Brown Gray Red Silty Clay
14 to 35 Brown Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

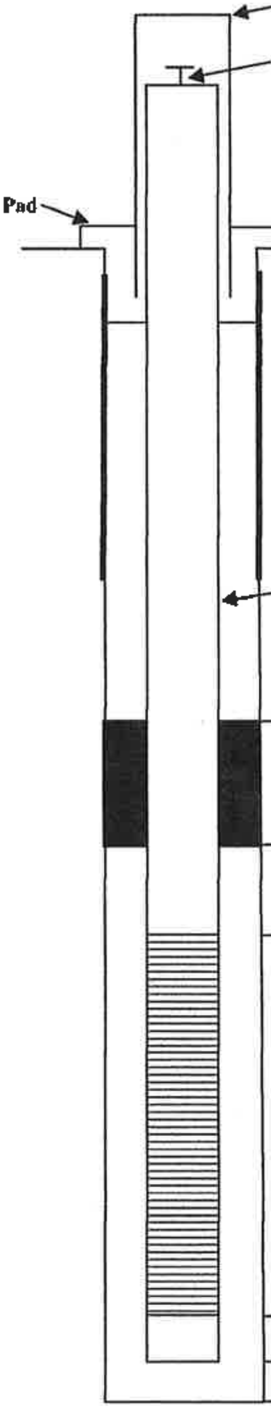
Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

00954091

D-25

AECOM	Client: USACE	WELL ID: ~~50WWF~~ 50WW16
	Project Number: 60256135	
	Site Location: Site 50	Date Installed: 9/10/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/Portland	4/11/13
Amount Used		35.7 Gals
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		15'
Bentonite Type	3/8" Chips	
Amount Used	1.5 x 50lb. Bags	
Top of Sand		18'
Top of Screen		20.1'
Screen:		
Length	14.1'	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness		
Amount Used	10 x 50lb Bags	
Bottom of Screen		34.6'
Bottom of Well Casing		35.2'
Bottom of Borehole		35.2'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

00954092

STATE OF TEXAS WELL REPORT for Tracking #345203

Owner:	**USACE**	Owner Well #:	**50WW16**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 43" N**
Well County:	**Harrison**	Longitude:	**094° 08' 22" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954093

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345203**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 4.5 Brown Silty Sand
4.5 to 5 Brown Gray Red Silty Clay
5 to 10 Tan Silty Sand
10 to 35 Brown Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

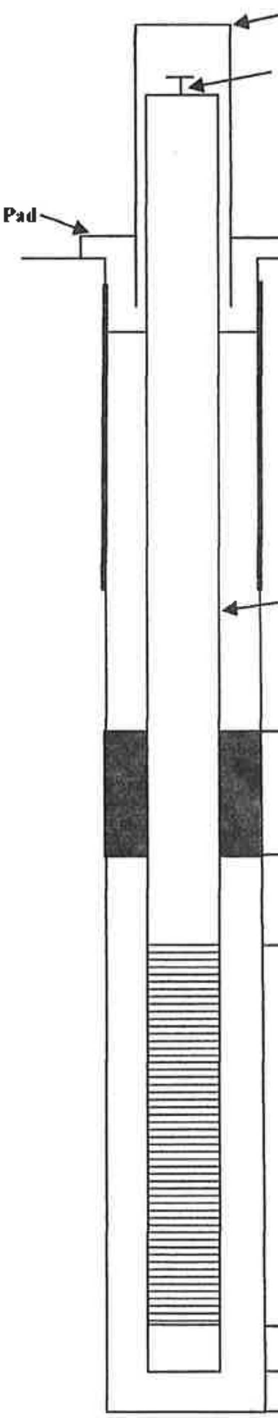
Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

00321808

AECOM	Client: USACE	WELL ID: ~~50WWG~~ 50WW17
	Project Number: 60256135	
	Site Location: Site 50	Date Installed: 9/6/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Surface Casing:
- Length ______
- Inside Diameter (ID) ______
- Type of Material ______

Grout:
- Type: Bentonite/Portland — 9/7/13
- Amount Used ______ — 21 Gals

Well Casing
- Inside Diameter (ID): 2"
- Type of Material: SCH 40 PVC

Top of Bentonite: 15.5'
- Bentonite Type: 3/8" chips
- Amount Used: 1.5 x 50lb bags

Top of Sand: 17.5'

Top of Screen: 19.9'

Screen:
- Length: 42.8'
- Inside Diameter (ID): 2"
- Slot Size: 0.010"
- Type of Material: SCH 40 PVC
- Type/Size of Sand: 20/40
- Sand Pack Thickness: 47.5'
- Amount Used: 26 x 50lb bags

Bottom of Screen: 64.4'

Bottom of Well Casing: 65'

Bottom of Borehole: 65'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

D-29

00954095

STATE OF TEXAS WELL REPORT for Tracking #345208

Owner:	**USACE**	Owner Well #:	**50WW17**
Address:	**Hwy 43** **Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43** **Karnack , TX 75670**	Latitude:	**32° 40' 44" N**
Well County:	**Harrison**	Longitude:	**094° 08' 16" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 65 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services** **4647 Brass Way** **Dallas , TX 75236**
Driller License Number:	**54611**

00954096

D-30

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345208**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 5 Brown Gray Red Silty Clay
5 to 8.5 Tan Silty Sand
8.5 to 12 Brown Silty Sandy Clay
12 to 22 Gray Silty Clay
22 to 24 Gray Silt
24 to 65 Gray Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/65 0.010 Slotted

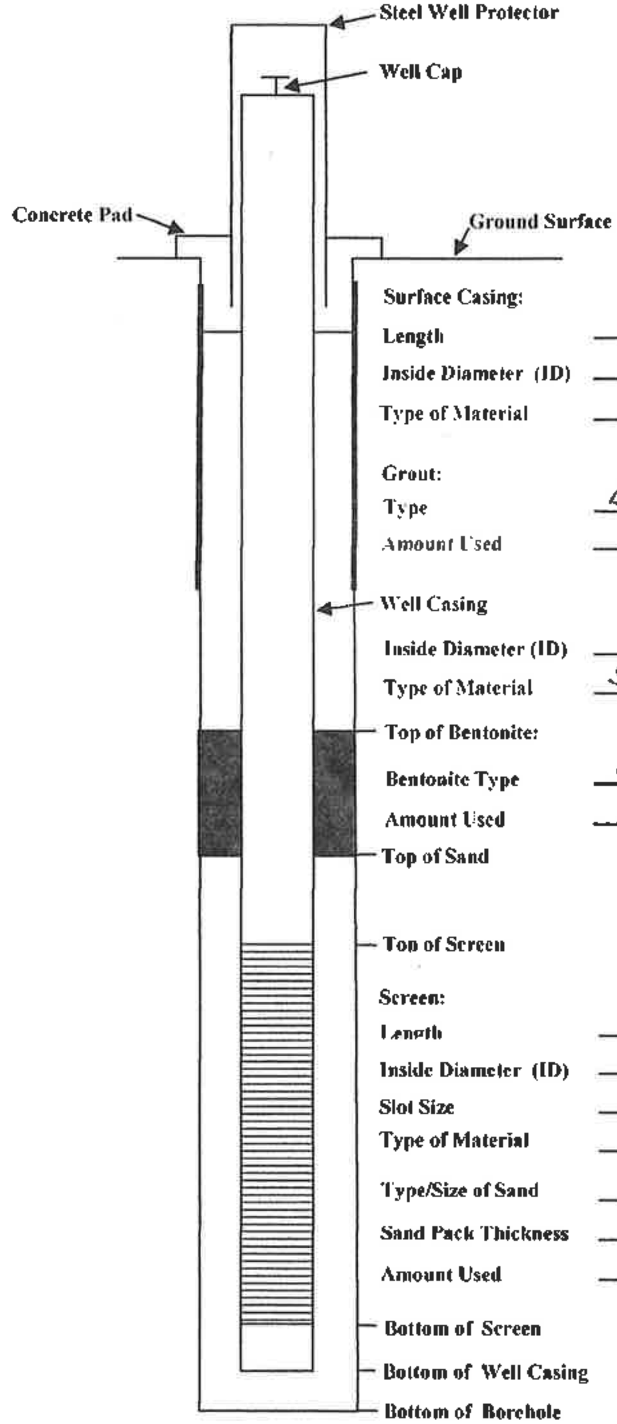
00954097

D-31

AECOM

Client: USACE	WELL ID: ~~50WW11~~ 50WW18
Project Number: 60256135	
Site Location: Site 50	Date Installed: 9/7/13
Well Location: Coords:	Borehole Diameter: 8"
Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Surface Casing:
Length ______
Inside Diameter (ID) ______
Type of Material ______

Grout:
Type: Bentonite/Portland
Amount Used: ~~[illegible]~~ — 9/7/13 23.1 Gals

Well Casing
Inside Diameter (ID): 2"
Type of Material: SCH 40 PVC

Top of Bentonite: 15'
Bentonite Type: 3/8" Chips
Amount Used: 1.5 x 50lb bag
Top of Sand: 18'

Top of Screen: 20.1'

Screen:
Length: 14.1
Inside Diameter (ID): 2"
Slot Size: 0.010"
Type of Material: SCH 40 PVC
Type/Size of Sand: 20/40
Sand Pack Thickness: 17.2
Amount Used: 10 x 50lb. Bags

Bottom of Screen: 34.6'
Bottom of Well Casing: 35.2'
Bottom of Borehole: 35.2'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

STATE OF TEXAS WELL REPORT for Tracking #345211

Owner:	**USACE**	Owner Well #:	**50WW18**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 44" N**
Well County:	**Harrison**	Longitude:	**094° 08' 17" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954099

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345211**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 9 Brown Silty
9 to 18 Gray Sandy Silty Clay
18 to 35 Gray Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

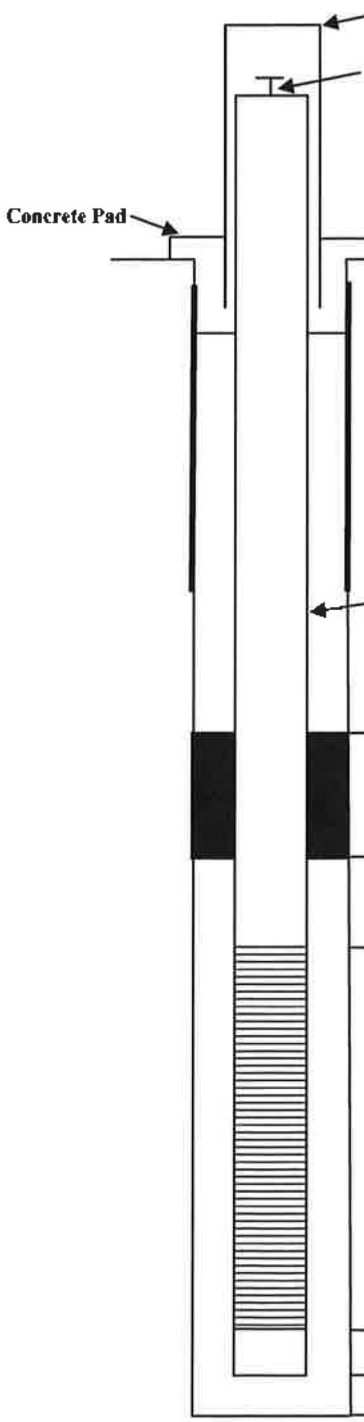
Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

00954100

D-34

AECOM		
Client: USACE		WELL ID: ~~50mw-2~~ 50WW19
Project Number: 60256135		
Site Location: Site 50		Date Installed: 9/5/13
Well Location:	Coords:	Borehole Diameter: 8"
Method: HSA		Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/Portland	9/7/13
Amount Used		16.8 Gals
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		15'
Bentonite Type	3/8" chips	
Amount Used	2.0 x 50lb bag	
Top of Sand		17'
Top of Screen		19.1'
Screen:		
Length	42.8'	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness	48'	
Amount Used	20 x 50lb Bags	
Bottom of Screen		63.6'
Bottom of Well Casing		64.2'
Bottom of Borehole		65'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

00954101

STATE OF TEXAS WELL REPORT for Tracking #345219

Owner:	**USACE**	Owner Well #:	**50WW19**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43 Karnack , TX 75670**	Latitude:	**32° 40' 43" N**
Well County:	**Harrison**	Longitude:	**094° 08' 15" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 65 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 17 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**

Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**

Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954102

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345219**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 4.5 Brown Silty Clay
4.5 to 9 Brown Silty Sand
9 to 22 Gray Silty Clay
22 to 27 Brown Silty Sand
27 to 28 Greenish Gray Silty Clay
28 to 65 Gray Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/19 Sched. 40
2 New PVC Screen 19/64 0.010 Slotted

00954103

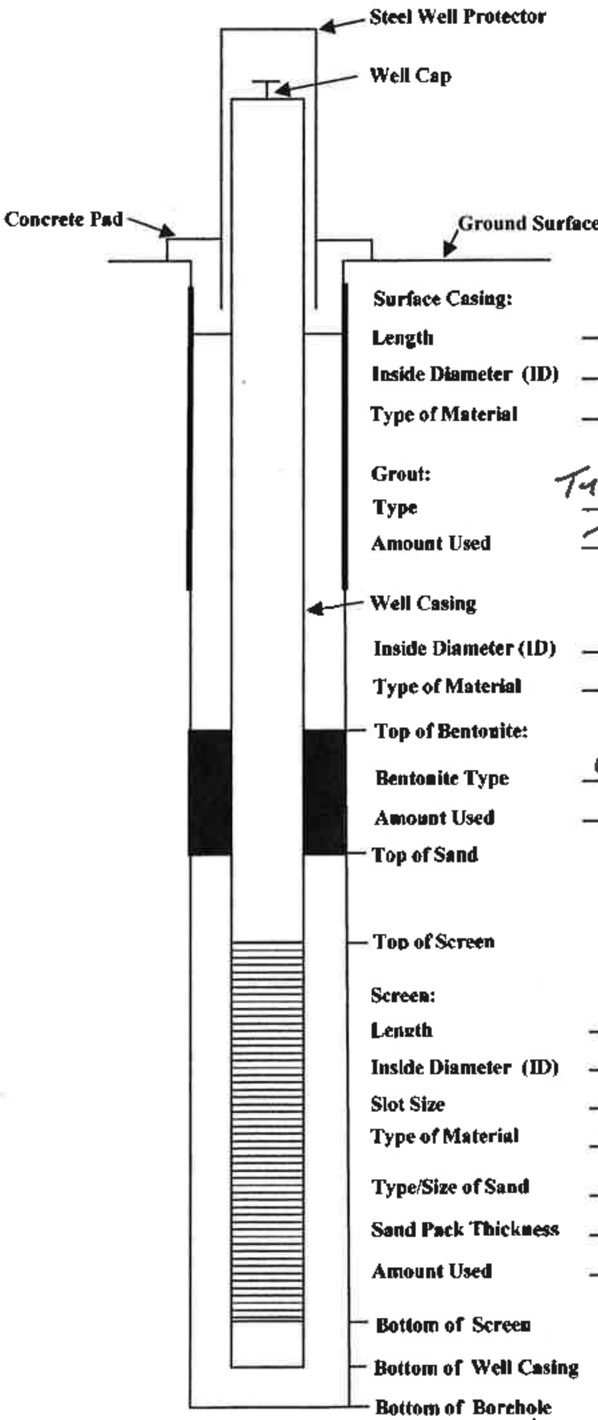
D-37

00321817

AECOM

Client: USACG		WELL ID: ~~50WWJ~~, 50WW20
Project Number: 60256135		Date Installed: 8/13/13
Site Location: SITE 50		Borehole Diameter: 8'/4"
Well Location: 50WWJ	Coords:	Contractor: TSS
Method: HSA		

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Surface Casing:
Length: NA
Inside Diameter (ID): NA
Type of Material: NA

Grout:
Type: TYPE I/II PORTLAND CEMENT w/BENTONITE
Amount Used: ~30gal (4.01ft³)

Well Casing
Inside Diameter (ID): 2"
Type of Material: SCH. 40 PVC

Top of Bentonite: 12.9'
Bentonite Type: CHIPS
Amount Used: 1.1 ft³
Top of Sand: 15.9'

Top of Screen: 18.3'

Screen:
Length: 34.5'
Inside Diameter (ID): 2"
Slot Size: 0.01"
Type of Material: SCH. 40 PVC
Type/Size of Sand: 20/40
Sand Pack Thickness: 37.4
Amount Used: 13.2 ft³

Bottom of Screen: 52.8'
Bottom of Well Casing: 53.3'
Bottom of Borehole: 60.0'

Borehole Diameter: 8'/4"

Comments: BOTTOM OF BOREHOLE WAS BACKFILLED w/BENTONITE TO 54' AND TO 53.3' w/SAND

Installation Observed By: G. HILTON

00954104

STATE OF TEXAS WELL REPORT for Tracking #345222

Owner:	**USACE**	Owner Well #:	**50WW20**
Address:	**Hwy 43** **Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hyw 43** **Karnack , TX 75670**	Latitude:	**32° 40' 39" N**
Well County:	**Harrison**	Longitude:	**094° 08' 18" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 60 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 12 ft with Grout (#sacks and material)** 3rd Interval: **From 12 ft to 16 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**TotalSupport Services** **4647 Brass Way** **Dallas , TX 75236**
Driller License Number:	**54611**

00954105

D-39

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**345222**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 7 Gray Red Brown Silty Clay
7 to 8 Brown Silty Sand
8 to 15 Gray Silty Clay
15 to 17 Brown Silty Sand
17 to 19 Brown Silty Clay
19 to 51 Red Brown Silty Sand
51 to 53 Lignite
53 to 60 Gray Silty Clay

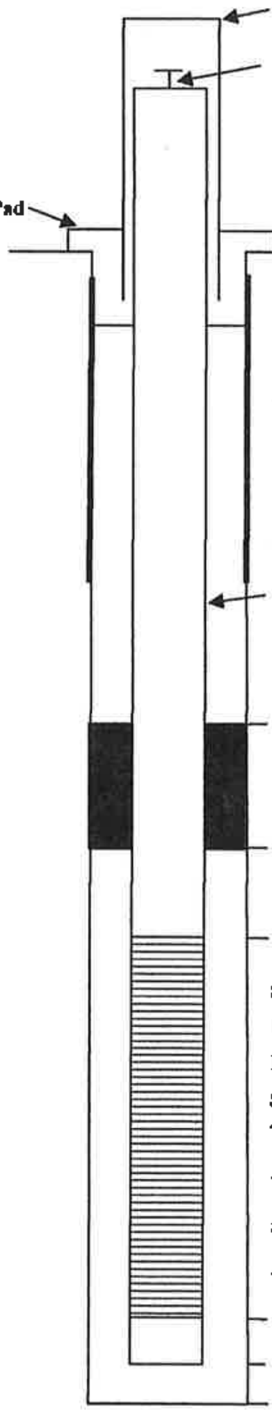
CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/18 Sched. 40
2 New PVC Screen 18/53 0.010 Slotted

00954106

AECOM		
Client: USACE		WELL ID: ~~[illegible]~~ 50WW21
Project Number: 60256135		
Site Location: Site 50		Date Installed: 8/24/13
Well Location:	Coords:	Borehole Diameter: 8"
Method: HSA		Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Steel Well Protector

Well Cap

Concrete Pad

Ground Surface

		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/~~Portland~~	8/24/13
Amount Used		29.4 Gals
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		14.5'
Bentonite Type	3/8" chips	
Amount Used	1.5 x 50lb Bags	
Top of Sand		18'
Top of Screen		19.9'
Screen:		
Length	14.1	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness	17'	
Amount Used	9 x 50lb. Bags	
Bottom of Screen		34.4'
Bottom of Well Casing		35'
Bottom of Borehole		35'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

STATE OF TEXAS WELL REPORT for Tracking #353070

Owner:	**USACE**	Owner Well #:	**50WW21**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hwy 43 Karnack , TX 75670**	Latitude:	**32° 40' 40" N**
Well County:	**Harrison**	Longitude:	**094° 08' 21" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 14.5 ft with Grout (#sacks and material)** 3rd Interval: **From 14.5 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**Total Support Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954108

D-42

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 5 Gray Red Brown Silty Clay
5 to 9 Gray Sand
9 to 10 Gray Sandy Clay
10 to 35 Red Brown Silty Sand

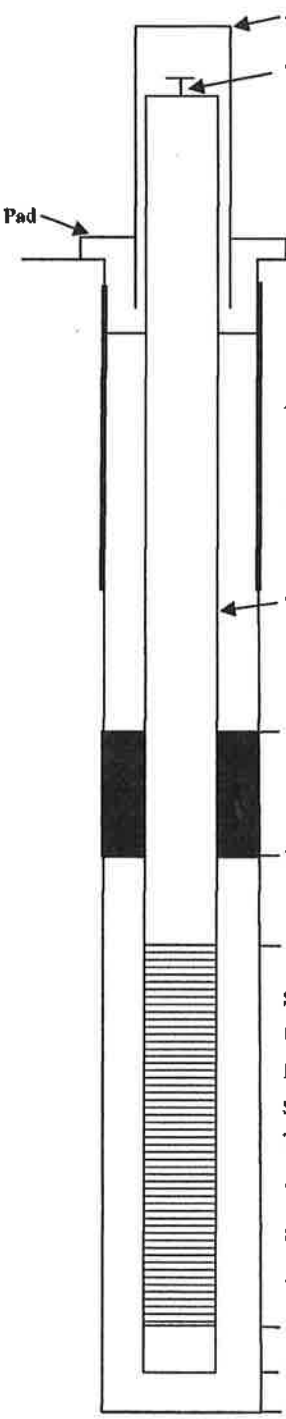
CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

00954109

AECOM		
Client: USACE		WELL ID: ~~59WWC~~ 50WW22
Project Number: 60256135		
Site Location: Site 50		Date Installed: 8/23/13
Well Location:	Coords:	Borehole Diameter: 8"
Method: HSA		Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Surface Casing:
- Length: ______
- Inside Diameter (ID): ______
- Type of Material: ______

Grout:
- Type: Bentonite/Portland
- Amount Used: ______ 8/23/13 31.5 Gals

Well Casing
- Inside Diameter (ID): 2"
- Type of Material: SCH 40 PVC

Top of Bentonite: 16'
- Bentonite Type: 3/8" chips
- Amount Used: 1.5 bags (50lb)

Top of Sand 18'

Top of Screen 19.80 AL

Screen:
- Length: 14.1
- Inside Diameter (ID): 2"
- Slot Size: 0.010"
- Type of Material: SCH 40 PVC
- Type/Size of Sand: 20/40
- Sand Pack Thickness: ______
- Amount Used: 10x 50lbs. bags

Bottom of Screen 34.4

Bottom of Well Casing 35

Bottom of Borehole 35

Borehole Diameter: 8"

Comments: ______

Installation Observed By: M. Lew

STATE OF TEXAS WELL REPORT for Tracking #353071

Owner:	**USACE**	Owner Well #:	**50WW22**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hwy 43 Karnack , TX 75670**	Latitude:	**32° 40' 40" N**
Well County:	**Harrison**	Longitude:	**094° 08' 24" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 16 ft with Grout (#sacks and material)** 3rd Interval: **From 16 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**

Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**

Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**Total Support Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954111

D-45

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 18 Gray Red Brown Silty Clay
18 to 35 Red Brown Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

00954112

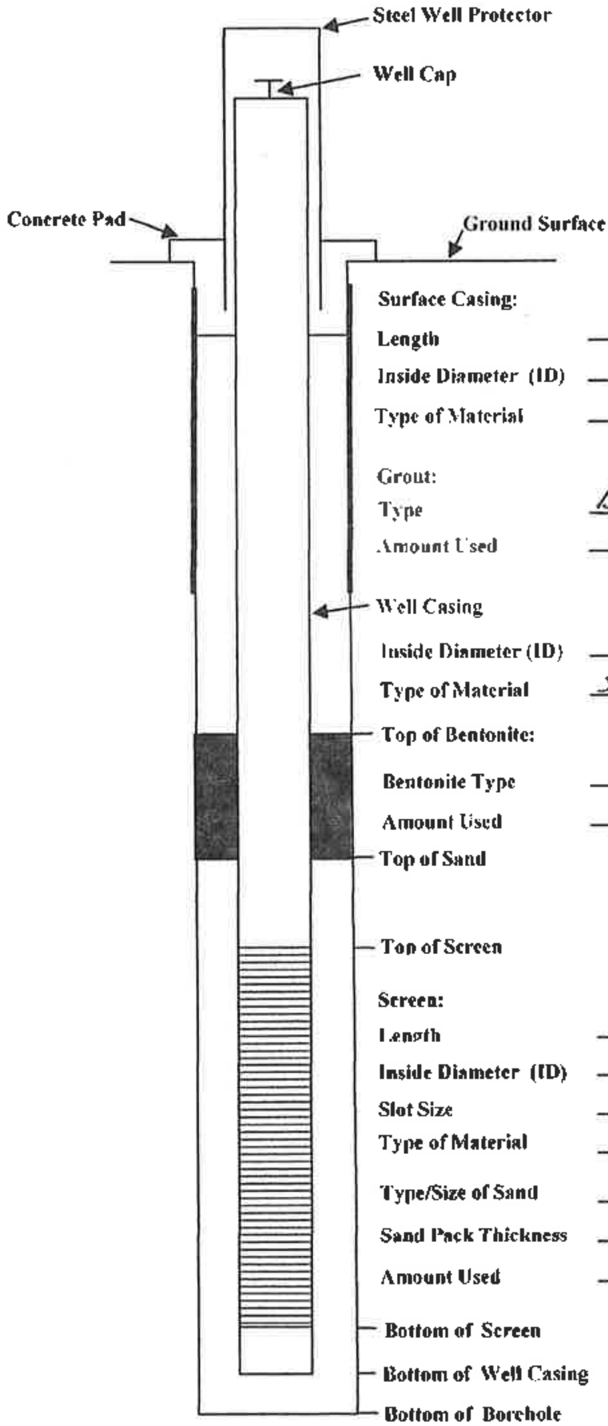
D-46

00321826

AECOM	Client: USACE	WELL ID: ~~50WW-M~~ 50WW23
	Project Number: 60256135	
	Site Location: Site 50	Date Installed: 8/25/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Surface Casing:
Length ______
Inside Diameter (ID) ______
Type of Material ______

Grout:
Type: Bentonite/Portland — 8/25/13 25.2 Gals
Amount Used ______

Well Casing
Inside Diameter (ID): 2"
Type of Material: SCH 40 PVC

Top of Bentonite: 15'
Bentonite Type: 3/8" chips
Amount Used: 1.5 x 50lb bags
Top of Sand: 18'

Top of Screen: 20'

Screen:
Length: 14.1
Inside Diameter (ID): 2"
Slot Size: 0.010"
Type of Material: SCH 40 PVC
Type/Size of Sand: 20/40
Sand Pack Thickness ______
Amount Used: 10 x 50lb Bags

Bottom of Screen: 34.5'
Bottom of Well Casing: 35.1'
Bottom of Borehole: 35.1'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

00954113

STATE OF TEXAS WELL REPORT for Tracking #353072

Owner:	**USACE**	Owner Well #:	**50WW23**
Address:	**Hwy 43** **Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hwy 43** **Karnack , TX 75670**	Latitude:	**32° 40' 41" N**
Well County:	**Harrison**	Longitude:	**094° 08' 20" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**Total Support Services** **4647 Brass Way** **Dallas , TX 75236**
Driller License Number:	**54611**

00954114

D-48

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 15 Gray Red Brown Silty Clay
15 to 35 Red Brown Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20 Sched. 40
2 New PVC Screen 20/35 0.010 Slotted

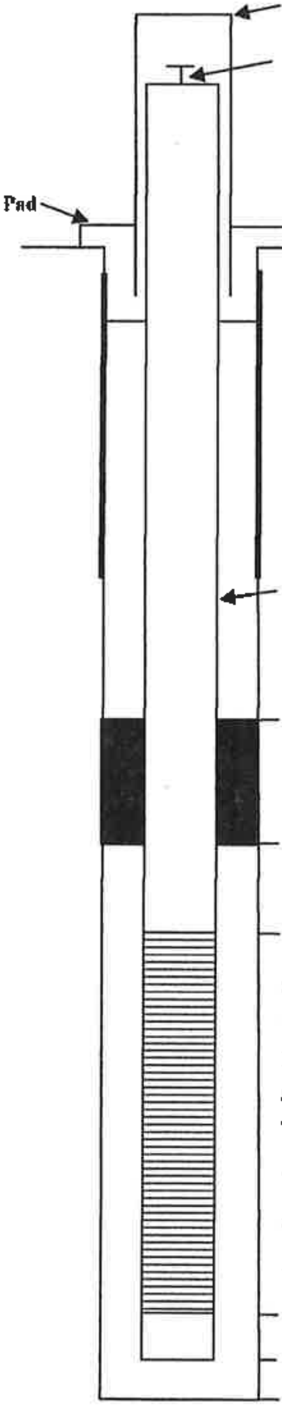
00954115

D-49

AECOM

Client: USACE	WELL ID: ~~50WW??~~ 50WW24
Project Number: 60256135	
Site Location: Site 50	Date Installed: 8/24/13
Well Location: Coords:	Borehole Diameter: 8"
Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Steel Well Protector

Well Cap

Concrete Pad

Ground Surface

Surface Casing:
Length ______
Inside Diameter (ID) ______
Type of Material ______

Grout:
Type: Bentonite/Portland — 8/24/13
Amount Used ______ — 3.5 Gals

Well Casing
Inside Diameter (ID): 2"
Type of Material: SCH 40 PVC

Top of Bentonite: — 15'
Bentonite Type: 3/8" Chips ~~Bentonite/Portland~~ ML
Amount Used: 1 bag (50lb)
Top of Sand — 18'

Top of Screen — 20.4'

Screen:
Length: 14.1
Inside Diameter (ID): 2"
Slot Size: 0.010"
Type of Material: SCH 40 PVC

Type/Size of Sand: 20/40
Sand Pack Thickness: 17.5
Amount Used: 10 x 50lb bags

Bottom of Screen — 34.9'
Bottom of Well Casing — 35.5'
Bottom of Borehole — 35.5'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

STATE OF TEXAS WELL REPORT for Tracking #353073

Owner:	**USACE**	Owner Well #:	**50WW24**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hwy 43 Karnack , TX 75670**	Latitude:	**32° 40' 41" N**
Well County:	**Harrison**	Longitude:	**094° 08' 18" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 35 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)** 3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**Total Support Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954117

D-51

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking number (Tracking #**353073**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 15 Gray Red Brown Silty Clay
15 to 35 Red Brown Silty Sand

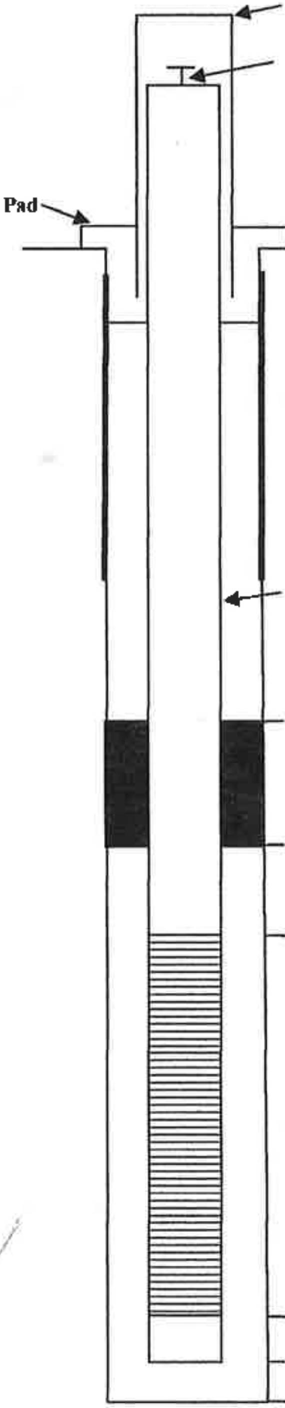
CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/20.5 Sched. 40
2 New PVC Screen 20.5/35.5 0.010 Slotted

00954118

AECOM	Client: USACE	WELL ID: ~~50WW10~~ 50WW25
	Project Number: 60256135	
	Site Location: Site 50	Date Installed: 9/10/13
	Well Location: Coords:	Borehole Diameter: 8"
	Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Surface Casing:
Length ____
Inside Diameter (ID) ____
Type of Material ____

Grout:
Type Bentonite/Portland
Amount Used ____ 9/11/13 42 Bags

Well Casing
Inside Diameter (ID) 2"
Type of Material SCH 40 PVC

Top of Bentonite: 37'
Bentonite Type 3/8" Chips
Amount Used 1.5 x 50lb bags
Top of Sand 43'

Top of Screen 45'

Screen:
Length 9.55'
Inside Diameter (ID) 2"
Slot Size 0.010"
Type of Material SCH 40 PVC
Type/Size of Sand 20/40
Sand Pack Thickness ____
Amount Used 6 x 50lb. Bags

Bottom of Screen 54.4
Bottom of Well Casing 55
Bottom of Borehole 55

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Low

STATE OF TEXAS WELL REPORT for Tracking #353075

Owner:	**USACE**	Owner Well #:	**50WW25**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hwy 43 Karnack , TX 75670**	Latitude:	**32° 40' 44" N**
Well County:	**Harrison**	Longitude:	**094° 08' 25" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 55 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 37 ft with Grout (#sacks and material)** 3rd Interval: **From 37 ft to 43 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**Total Support Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954120

D-54

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 17 Gray Red Brown Silty Clay
17 to 24 Red Brown Silty Sand
24 to 25 Brown Sandy Clay
25 to 30 Brown Silty Sand
30 to 35 Brown Silty Sand And Clay
35 to 46 Brown Silty Sand
46 to 55 Brown Silty Sand W/Clay Seams

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/45 Sched. 40
2 New PVC Screen 45/55 0.010 Slotted

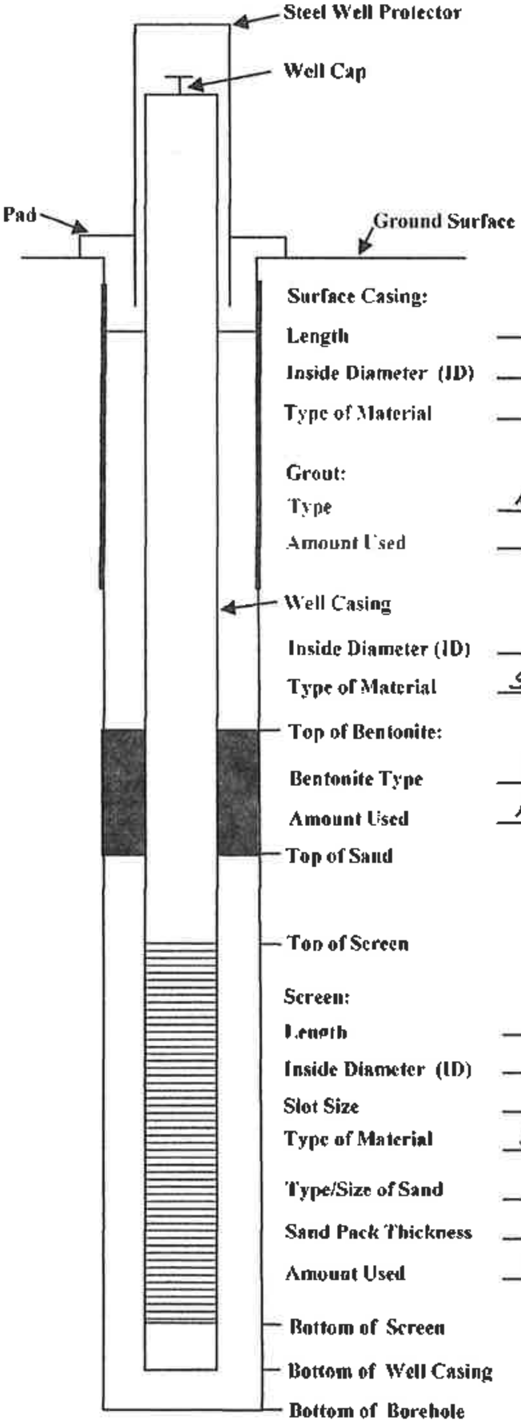
00954121

D-55

AECOM

Client: USACE	WELL ID: ~~50WW5~~ 50WW26
Project Number: 60256135	Date Installed: 9/5/13
Site Location: Site 50	
Well Location: Coords:	Borehole Diameter: 8"
Method: HSA	Contractor: TSS

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		
Type	Bentonite/Portland	9/11/13
Amount Used		46.2 Gals
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		40'
Bentonite Type	3/8" Chips	
Amount Used	1.5 x 50lbs Bags	
Top of Sand		43'
Top of Screen		45.1'
Screen:		
Length	14.1'	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness		
Amount Used	10 x 50lb. Bag	
Bottom of Screen		59.6'
Bottom of Well Casing		60.2'
Bottom of Borehole		60.2'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

00954122

STATE OF TEXAS WELL REPORT for Tracking #353079

Owner:	**USACE**	Owner Well #:	**50WW26**
Address:	**Hwy 43 Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hwy 43 Karnack , TX 75670**	Latitude:	**32° 40' 40" N**
Well County:	**Harrison**	Longitude:	**094° 08' 21" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 60 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 40 ft with Grout (#sacks and material)** 3rd Interval: **From 40 ft to 43 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**Total Support Services 4647 Brass Way Dallas , TX 75236**
Driller License Number:	**54611**

00954123

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**

Apprentice Registration Number: **No Data**

Comments: **No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 10 Gray Red Brown Silty Clay
10 to 35 Brown Silty Sand
35 to 36 Brown Sandy Clay
36 to 50 Brown Silty Sand
50 to 51 Brown Sandy Clay
51 to 52 Gray Clay
52 to 53 Gray Sand
53 to 55 Gray Sand And Clay
55 to 60 Gray Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/45 Sched. 40
2 New PVC Screen 45/60 0.010 Slotted

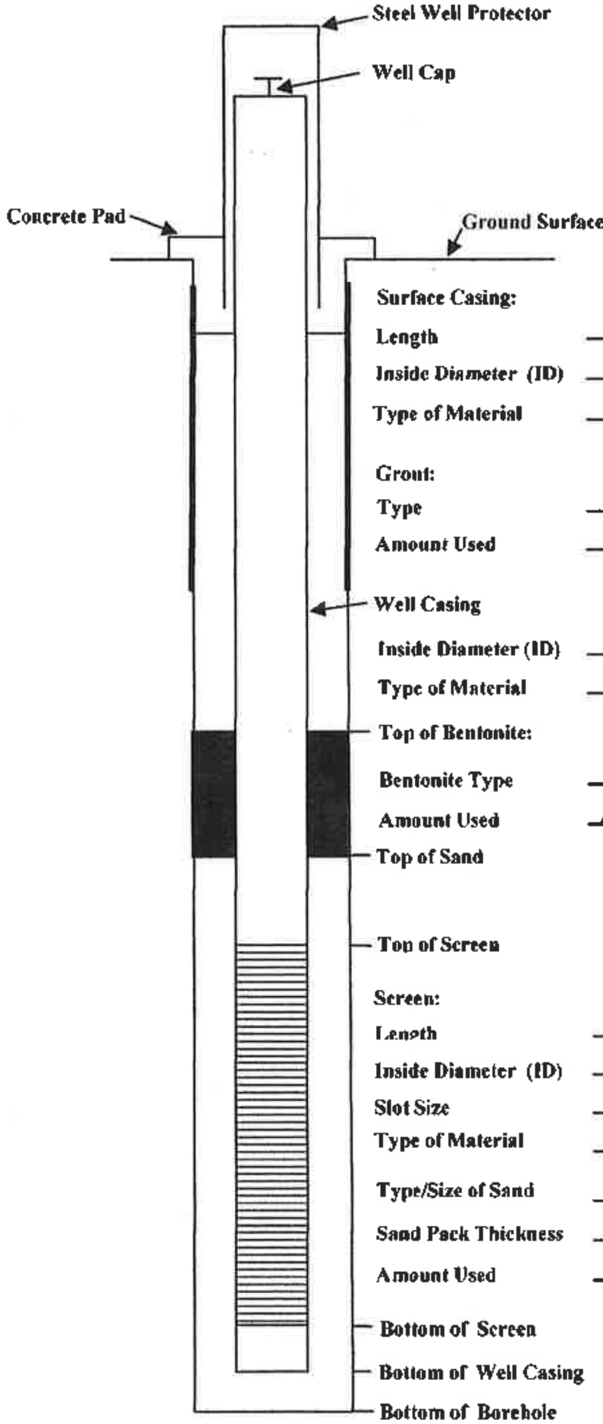
00954124

D-58

AECOM

Client: USACE		WELL ID:	~~50WW??~~ 50WW27
Project Number: 60256135			
Site Location: Site 50		Date Installed:	9/9/13
Well Location:	Coords:	Borehole Diameter:	8"
Method: HSA		Contractor:	TSS

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)
Surface Casing:		
Length		
Inside Diameter (ID)		
Type of Material		
Grout:		9/9/13
Type	Bentonite/Portland	46.2 Gals
Amount Used		
Well Casing		
Inside Diameter (ID)	2"	
Type of Material	SCH 40 PVC	
Top of Bentonite:		35'
Bentonite Type	3/8" Chips	
Amount Used	1.5 x 50lb bags	
Top of Sand		40.5'
Top of Screen		42.9'
Screen:		
Length	14.1'	
Inside Diameter (ID)	2"	
Slot Size	0.010"	
Type of Material	SCH 40 PVC	
Type/Size of Sand	20/40	
Sand Pack Thickness	19.5'	
Amount Used	11 x 50lb bags	
Bottom of Screen		57.4'
Bottom of Well Casing		58'
Bottom of Borehole		60'

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

00954125

STATE OF TEXAS WELL REPORT for Tracking #353080

Owner:	**USACE**	Owner Well #:	**50WW27**
Address:	**Hwy 43** **Karnack , TX 75670**	Grid #:	**35-23-6**
Well Location:	**Hwy 43** **Karnack , TX 75670**	Latitude:	**32° 40' 42" N**
Well County:	**Harrison**	Longitude:	**094° 08' 24" W**
Elevation:	**No Data**	GPS Brand Used:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/8/2013** Completed: **9/18/2013**
Diameter of Hole:	Diameter: **8 in From Surface To 60 ft**
Drilling Method:	**Hollow Stem Auger**
Borehole Completion:	Other: **20/40 Silica Sand**
Annular Seal Data:	1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)** 2nd Interval: **From 2 ft to 35 ft with Grout (#sacks and material)** 3rd Interval: **From 35 ft to 40.5 ft with Bentonite (#sacks and material)** Method Used: **Tremmie** Cemented By: **Crew** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**
Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**
Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**
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 log(s) being returned for completion and resubmittal.
Company Information:	**Total Support Services** **4647 Brass Way** **Dallas , TX 75236**
Driller License Number:	**54611**

00954126

D-60

Licensed Well Driller Signature:	**Brian Kern**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 10 Gray Red Brown Silty Clay
10 to 35 Brown Silty Sand
35 to 36 Brown Sandy Clay
36 to 50 Brown Silty Sand
50 to 55 Gray Sand And Clay
55 to 60 Gray Silty Sand

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
2 New PVC Riser 0/43 Sched. 40
2 New PVC Screen 43/58 0.010 Slotted

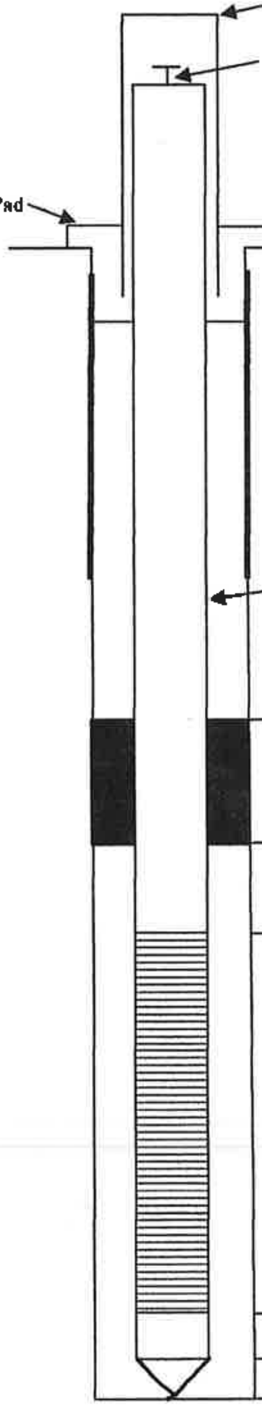
00954127

D-61

AECOM

Client: USACE		WELL ID:	
Project Number: 60256135		50WW28	
Site Location: LHAAP-50		Date Installed:	5/6/14
Well Location:	Coords:	Borehole Diameter:	~~8~~8 1/4"
Method: HSA		Contractor:	FUGRO

MONITORING WELL CONSTRUCTION DETAIL



Depth from G.S. (feet)

Steel Well Protector

Well Cap

Concrete Pad

Ground Surface

		Depth from G.S. (feet)
Surface Casing:		
Length	NA	
Inside Diameter (ID)	NA	
Type of Material	NA	
Grout:		
Type	CEMENT-BENTONITE	
Amount Used	~17 GALLONS	
Well Casing		
Inside Diameter (ID)	4"	
Type of Material	PVC	
Top of Bentonite:		10' 0"
Bentonite Type	1/4" PELLETS (BAROID)	
Amount Used	50# (1 PAIL)	
Top of Sand		12' 0"
Top of Screen		13' 9"
Screen:		
Length	10'	
Inside Diameter (ID)	4"	
Slot Size	0.010	
Type of Material	PVC	
Type/Size of Sand	20/40 SILICA	
Sand Pack Thickness	12' 3"	
Amount Used	9-50# BAGS	
Bottom of Screen		23' 9"
Bottom of Well Casing		24' 3"
Bottom of Borehole		24' 3"

Borehole Diameter: 8 1/4"

Comments:

Installation Observed By: G. MCDONNELL

Total Support Services

00321729

50WW10

Rig Mob 6 BSG

AECOM

Client: USACE			BORING ID: ~~50WW~~ A3
Project Number: 60256135			
Site Location: Site 50			
Coordinates:		Elevation	Sheet 1 of 6
Drilling Method: HSA			Monitoring Well Installed:
4" - Sample Type(s): ~~GATE~~ CONTINUOUS Mills.		Boring Diameter: 8	Screened Interval:
Weather: Clear 90°	Logged By: Hartford	Date/Time Started: 930 8/5/13	Depth of Boring:
Drilling Contractor: ~~BUGRO~~ TSS	Ground Elevation:	Date/Time Finished:	Water Level: 18.5

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Sample Run ~~Blows per 6"~~	Recovery (inches)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
1–5			1	48	0.0	CL	Phone wire conduit at 1.5 ft - dead. SILTY CLAY, yellowish brown moist. Color change pale brown to yellowish brown to light grey at 4.5 ft		
5–10			2	48	0.0	SM	6.5-8 FINE SILTY SAND, brownish yellow, moist		
						CL	8-14.5 SILTY CLAY, mottled, gray, and brownish yellow, damp. trace fine sand		
10–15			3	48	7.4				
						SM	14.5- FINE Silty SAND, mottled brownish yellow & grey, moist, trace clay		
15–20			4	60	0.4		FINE Silty Sand mottled grey and olive yellow moist. wet at 18.5 ft. Trace fine roots ~~at~~ 17'		

NOTES:	Date	Time	Depth to groundwater while drilling
Silty fine sand color changes appear as stainings and may be bedding related although no grain size difference noted			

Checked by: Date:

00954129

C-14

50WW10

AECOM

Client: USACE			BORING ID: ~~50WWA3~~
Project Number: 60256135			
Site Location: S.G. 50			
Coordinates:	Elevation		Sheet 2 of 6
Drilling Method: HSA			Monitoring Well Installed:
Sample Type(s): Mills Continuous	Boring Diameter: 8		Screened Interval:
Weather: Clear 100°	Logged By: Hartford	Date/Time Started:	Depth of Boring:
Drilling Contractor: JSS	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	~~Core~~ Sample Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
21–25			5	42	0.6	SM	20-23.5 SILTY FINE Sand with Clay Grey and reddish brown, bedded wet ~~wet~~ 23.5-30 SILTY FINE SAND, olive yellow and gray, wet		
26–30			6	60	0.0	SM	Same as above moist but probably saturated		
31–35			7	57	3.0	SP ~~SM~~ Poorly Graded	30-33.5 Poorly Graded ~~SILTY~~ Fine Sand, gray and olive brown, moist to wet; trace silt; 33.5-34 Iron oxide nodules with silty sand, reddish brown ~~SILTY SAND~~ Fine Sand, yellowish brown, moist to wet, trace silt		34-40
36–40			8	26	0.0	SP ~~SM~~	POORLY GRADED ~~SILTY~~ FINE SAND, light olive brown, wet, trace silt ~~trace silt~~		

NOTES: Drilled with 4¼ ID HSA to ~~60~~ 65 Continuous Sampled with a mills continuous sampler - Split Spoon to 67
Reamed hole using 10 wash rotary to 64
Set 6-in ID SCH 40 PVC Surface Casing to 64

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00321731

50WW10

AECOM

Client: USACE			BORING ID: ~~50WW~~ A3
Project Number: 60256135			
Site Location: SS 50			
Coordinates:	Elevation		Sheet 3 of 6
Drilling Method: HSA			Monitoring Well Installed:
Sample Type(s): mills Continuous	Boring Diameter: 8		Screened Interval:
Weather: Clear 100	Logged By: Hartford	Date/Time Started: 8	Depth of Boring:
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Sample Run ~~Blows per 6"~~	Recovery (inches)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
41–44			9	18	0.0	SP	40-40.5 Poorly Graded Fine Sand with silty clay laminations, olive ~~[illegible]~~ brown & Gray 40.5-41 Poorly Graded Fine Sand 41-41.5 same as 40-40.5 - trace of silty clay Gray		
44					Ø		NO RECOVERY		
45–50			10	24	0.0	SP	(?41 - Poorly GRADED Fine sand, dense ~~gray~~ gray, wet; NO Recovery		
50–55			11	18	CL- 0.0	~~SC~~ ~~SC~~ 50.8 SP	50.4-50.8 ~~Clayey~~ Fine sandy Clay gray, wet, low plasticity, POORLY GRADED Fine Sand, gray, wet; NO RECOVERY		
55–60			12	24	0.0		POORLY GRADED Fine Sand, gray wet; No Recovery		

NOTES: ~~[illegible]~~ · 55-60 zone sample rods were 5' short - then sampled after running augers down - so sample is disturbed sample from inside the Auger - still in sand.

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954131

AECOM

Client: USACE		BORING ID: 50WW10 (~~50WW13~~)
Project Number: 60256135		
Site Location: S.G 50		
Coordinates:	Elevation	Sheet 4 of 8
Drilling Method: HSA		Monitoring Well Installed:
Sample Type(s): Mills Continuously	Boring Diameter: 8	Screened Interval:
Weather: / Logged By: Hartford	Date/Time Started:	Depth of Boring:
Drilling Contractor: TSS / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Core Run / Blows-per-6"	Recovery (inches)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
61					C.0	CL/SP	2" laminated silty clay and PG fine sand		
62		Core Barrel	13	18	0.3	Coal	coal lignite 61.0-63.0, Breaks apart easily into ½" cubes with smooth edges	Coal Aquitard	
63-64		Split Spoon	14	18	0.0	CL	63.0-64.0 lean clay, dark brown, hard, dry laminated, lean clay, and silty fine sand 64.0-64.5	CLAY AQUITARD	~~64-64.5~~
65		Core Barrel	15	12			~~65-65.5~~ 64.5-65 Dark brown and gray, moist		
66-67		Split Spoon	16	18	0.0	SP-SC	65.0-65.5 lean clay; laminated lean clay and silty fine sand, dry/damp; 66 - poorly graded fine sand with clay, gray, moist and wet. laminated - more sandy than above and becoming wet.		
68		Split Spoon	17	20					
69-70		SP	18	18"	0.0		67 Silty clay w/ interlaminated & interbedded (to 1") fine sand; clay is dark gray, v. stiff, damp; sand is gray, moist	Glenn Hilton	Started 8/14/13
71		SP	19	12"		Coal	70.5 Lignite, black, damp/dry, hard		
72-73		SP	20	16"	0.0	CL	71.8 Silty clay, gray, damp/dry, hard, mod. plastic		
75		SP	21	18			75.8 Lignite, black, dry, hard		
76-77		SP	22	7"		Coal	Lignite as above with few silt interbeds, hard, black, dry		
77-78		SP	23	3"					
79						NR			
80									

NOTES: Soil became much harder at 61'. Assumed top of coal.
2 Hr. 20 min to drill 60-63.0 Stop run prior to 65 - Split spoon 63-64.5 - Core to 65.5 - Split spoon 65.5-67
Plan to set 6-in surface casing at 64.5

Date	Time	Depth to groundwater while drilling

Checked by: Date:

TD soil sampling prior to surface casing 67'

00321733

50WW10

AECOM	Client: USACE		BORING ID: ~~50WW-13~~
	Project Number: 60256135		
	Site Location: Site 50		
	Coordinates:	Elevation	Sheet 5 of 6
	Drilling Method: HSA		Monitoring Well Installed:
	Sample Type(s): Mills Continuous/Split Spoon	Boring Diameter: 5.5"	Screened Interval:
Weather: Sunny	Logged By: M. Law	Date/Time Started:	Depth of Boring:
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	~~Blows per 6"~~	Recovery (~~inches~~) %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
80–82		Split spoon	24	98%		COAL 80.3'	Lignite with few silt, Black, moist, hard		
						CL 82'	LEAN CLAY (CL) (80.3'–82') very hard, moist/dry, mostly clay, little fine sand, grading to little fine sand with trace mica, low plasticity		
82–85						NR			
85–87.5		Split spoon	25	98%		CL	LEAN CLAY with SAND (CL) (85'–85.4') Hard, moist, gray, mostly clay, little fine sand, low plasticity		
						COAL	Lignite stream (85.4'–85.6')		
						~~SP~~ CL	LEAN CLAY (CL) (85.6'–86') moist, gray, mostly clay, few fine sand, Low plasticity		
						SP	POORLY GRADED SAND with Silt (SP) (86'–87') Dense, ~~dry~~, gray, mostly fine sand, little silt, trace mica, non-plastic		
87.5–90						NR			
90–92		Split spoon	26	~~14"~~ 60%		SP	POORLY GRADED SAND with ~~CLAY~~ (SP) (90'–92') Dense, dry, gray, mostly fine sand, ~~some clay~~, trace mica, slightly to low plastic. thin laminations		
92–95						NR			
95–97		Split spoon	27	100%		SP	LEAN CLAY (CL) (95'–97') very stiff, Dry, very Dark gray, mostly clay, few fine sand bands, low plasticity		
97–100						NR			

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954133

00321734

50WW10

AECOM

Client: USACE			BORING ID: ~~50WW~~
Project Number: 60256135			
Site Location: Site 50			
Coordinates:		Elevation:	Sheet: 6 of 6
Drilling Method: HSA/Mud Rotary			Monitoring Well Installed: Yes
Sample Type(s): Split spoon		Boring Diameter: 5.5"	Screened Interval:
Weather: Sunny	Logged By: M. Law	Date/Time Started:	Depth of Boring: 110
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ /ft	Recovery ~~(inches)~~ %	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
100						CL	LEAN CLAY with sand (CL) (100'–100.2') stiff, moist, dark gray, mostly clay, little sand, low plasticity. — thin band of lignite @ 100.2'		
101		Split-Spoon	28	80%		SP	POORLY GRADED SAND (SP) (100.2'–102') Dense, moist, gray, mostly medium grained sand, sub-angular, few silt, nonplastic, possible Wilcox Fm.		
102									
103									
104									
105									
106		Split-spoon	29	30%		SP	POORLY GRADED SAND (SP) (105–107) Dense, moist, gray, mostly sand, medium grain, trace mica, non-plastic, few to trace silt.		
107									
108									
109									
110									
111		Split-Spoon	30	80%		CL	LEAN CLAY (CL) (110'–112') stiff, moist, dark gray, mostly clay, few fine sand, low plasticity, few silt.		
112									
113									
114									
115									
116									
117									
118									
119									
120									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954134

00321735

50WWII

AECOM

Client: USACE	BORING ID: 50-DPT-04/ ~~50WW-8~~
Project Number: 60256135	
Site Location: Site 50	
Coordinates:	Elevation:
Drilling Method: DPT/HSA	Sheet: 1 of 2
Sample Type(s): Macrocore / Mill barrel	Boring Diameter: 2"
Monitoring Well Installed: ~~No~~ Yes	Screened Interval: 20'-35'
Weather: Sunny 90°	Logged By: M. Law
Date/Time Started: 7/22/13 1507	Depth of Boring: 30'/35'
Drilling Contractor: Fugro	Ground Elevation:
Date/Time Finished: 7/23/13 0905	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
1		0-1'		~100%		ML	SILT (ML) (0-1') Dry, Brown, mostly Silt, fine grain, trace fine sand, nonplastic		
2–4		1'	1	~100%		CL	LEAN CLAY (1-5') moist to dry, Strong Brown to gray, fine grain, red mottling, Low plasticity, stiff		
5–8		5'	2	~100%		CL	SAME AS ABOVE (5'-9') Brownish gray, medium plasticity, Black mottles at 7' to 8' interval, stiff		
9–10		9'				ML	SILT (ML) (9'-10') Dry, Gray, mostly Silt, trace fine sand, few clay, slightly plasticity		
10–12		10'	3	≤80%		SP	Poorly Graded Sand (SP) (10'-12') Dry, Brown to gray, mostly fine sand, trace silt, non-plastic		
12–15		12'				NR	(NR) No Recovery (12'-15')		
15–20		15'	4	65%		ML	SILT with Sand (ML) (15-20') moist, Brown, mostly silt, little fine sand, non-plastic, trace mica		
20		20'							

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by ______ Date: ______

00954135

C-20

00321736

50WW11

AECOM

Client: USACE		BORING ID: 50DPT-04 ~~50WW8~~
Project Number:		
Site Location: Site 50		
Coordinates:	Elevation:	Sheet: 2 of 2
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
20						SP	Poorly Graded Sand with Silt (SP) (20'-30') moist, yellowish Brown, fine grain, mostly fine sand, little silt, trace mica, non-plastic.		
21									
22			5	~75%					
23									
24									
25									
26						SP	SAME AS ABOVE Wet to moist		
27			6	~75%					
28									
29									
30							End of DPT Boring @ 30' Bgs		
31								11/27/13	
32									
33			7	~50%		SP	SAME AS ABOVE		
34									
35							End of HSA Boring @ 35' Bgs		
36									
37									
38									
39									
40									

NOTES: Hydropunch sample screen interval (31'-35') Bgs

Checked by

Date:

Date	Time	Depth to groundwater while drilling

00954136

C-21

00321737

50WW12

AECOM	Client: USAEE		BORING ID: ~~50WW-6~~
	Project Number: 60256135		
	Site Location: Site 50		
	Coordinates:	Elevation	Sheet 1 of 2
	Drilling Method: HSA		Monitoring Well Installed: Yes
	Sample Type(s): Mill barrel	Boring Diameter: 8"	Screened Interval: 20-35'
Weather: Sunny 95'	Logged By: M. Law	Date/Time Started: 8/25/13 hrs	Depth of Boring: 35'
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished: 8/	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run ~~Blows per 6"~~	Recovery (%)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
1	~~[illegible]~~	~1'				ML	SILT (ML) (0-1') Dry, stiff, Pale Brown, mostly silt, few fine sand, non-plastic.		
2						CL			
3			1	~20%			LEAN CLAY (CL) ~~[illegible]~~ with SAND		
4						NR	Dry, stiff, Brown, mostly clay, ~~few~~ little fine sand, medium plasticity, Reddish Brown and light grey mottles, trace sand Bands above 8.5' bgs		
5									
6						CL			
7									
8			2	~100%			- becoming light bluish grey with yellowish Brown mottles below 8.5 bgs. few sand		
9									
10									
11						SP	POORLY GRADED SAND (SP)		
12							moist, loose, yellowish Brown with light bluish grey banding, ~~[illegible]~~ mostly fine sand, few silt, fine clay in AL banding, trace mica.		
13			3	~90%					
14									
15									
16							SAME AS ABOVE		
17							wet, ~~stiff~~ loose to medium dense, yellowish Brown, with light Bluish grey bands of sand with clay.		
18			4	~80%					
19									
20									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954137

C-22

50WW12

AECOM

Client: USACE		BORING ID: ~~50WWC~~
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 2 of 2
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: / Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	~~Blows per 6"~~ Run	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
21						SP	POORLY GRADDED SAND (SP)		
22			5	~80%			wet, loose, yellowish Brown, mostly fine sand, few silt, trace mica, non-plastic, trace Bluish gray bands @ 22' Bgs.		
23									
24							— Iron oxide staining @ 24.3' Bgs —		
25									
26						SP			
27							SAME AS ABOVE		
28			6	~80%			clay stringers @ 29' Bgs below		
29					CL →				
30									
31						SP			
32							SAME AS ABOVE		
33			7	~40%			laminated with few silts, trace Iron-oxide stained Bands.		
34									
35							End of Boring @ 35' Bgs —		
36									
37									
38									
39									
40									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

50WW14

AECOM

Client: USACE 613
Project Number: 60254185
Site Location: LHAAP SITE 50
Coordinates:
Elevation:
Drilling Method: DPT/HSA
Sample Type(s): Core Barrel
Boring Diameter: 2"
Weather: SUNNY WARM 80s
Logged By: GH/GM/ML
Date/Time Started: 0950
Drilling Contractor: FUGRO
Ground Elevation:
Date/Time Finished:

~~50WW02~~
BORING ID: 50DPT03
Sheet: 1 of 4
Monitoring Well Installed: Yes
Screened Interval:
Depth of Boring:
Water Level:

Time	Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6" Run #	Recovery (Inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
	0		0-0.5'			0.0		0-2.0' SILTY FINE SAND, BROWN, DRY		
1017	1						SM			
	2							2.0-5.0 SILTY CLAY, reddish-brown and light gray mottling, DAMP, VERY STIFF		
1020	3		2.5-3.0	1	60"	0.0		2.0-4.0 oxidation mottling -red-brown		
	4							4.0-5.0 mottling more yellow than red-brown		
1025	5		4.5-5.0 (+Dup)			0.0	CL	5.0-9.5 SILTY CLAY, Yellow and light gray mottling, VERY STIFF, DAMP		
	7							7.0-9.0 Minor black oxidation scattered throughout the interval		
	8			2	60"					
	9		9.5-10.0				SC	9.5-10.0 CLAYEY FINE SAND, Reddish-brown and light gray mottling, DAMP		
1035	10					0.0		10.0-15.0 SILTY FINE SAND, Reddish-brown with some light gray mottling, DAMP		
	12			3	36"					
	13						SM			
	15					0.0		15.0-20.0 SILTY FINE SAND, Reddish-brown. Minor light gray laminations rarely. DAMP		
	17			4	53"			15.0-15.5' LIGHT BROWNISH YELLOW CLAY, DAMP		
	19							19.5' GROUNDWATER MEASURED @ 1500		
	20									

Date	Time	Depth to groundwater while drilling

NOTES:

Checked by
Date:

00954139

00321740

AECOM

Client: USACE
Project Number:
Site Location:
Coordinates: | Elevation:
Drilling Method:
Sample Type(s): | Boring Diameter:

5OWW14

~~50WWD2~~

BORING ID: 50 DPT 03

Sheet: 2 of 3
Monitoring Well Installed:
Screened Interval:
Depth of Boring:
Water Level:

Weather:
Drilling Contractor:
Logged By: | Date/Time Started:
Ground Elevation: | Date/Time Finished:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Run #	Recovery (Inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
21							20-25.0' SILTY FINE SAND MOIST, Reddish-brown		
22			5	41"					
23									
24									
25						Sm			
26							25.0-28.5 SILTY FINE SAND, MOIST, Reddish-brown		
27									
28			6	60"			28.5-30.0 SILTY FINE SAND, WET, Reddish-brown		
29									
30					0.0				
31						SP	POORLY GRADED SAND with Silt (SP)		
32							moist, loose, Brown, mostly fine sand, little silt, trace mica, trace iron oxide staining in stringers.	8/26/3	
33			7	~60%					
34									
35									
36							— harder drilling @ 36.5' —		
37							SAME AS ABOVE		
38			8	~60%			trace clay stringers		
39									
40									

NOTES: WATER SAMPLE @ 1155; 25-30' INTERVAL

Date	Time	Depth to groundwater while drilling

Checked by | Date:

00954140

C-25

00321741

AECOM

Client: USACE		BORING ID: ~~50WW02~~ 50WW14 50DPT03
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 3 of 4
Drilling Method: DPT/HSA		Monitoring Well Installed: Yes
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: / Logged By: M. Law	Date/Time Started:	Depth of Boring:
Drilling Contractor: / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6"~~	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
41–45			9	~40%		SP	POORLY GRADED SAND with Silt (SP) moist, dense, dark yellowish Brown grading to ~~tan~~ gray, mostly fine sand, little silt, trace mica, trace Black ~~Silt~~ stringers, non-plastic		
45–50			10	~30%			SAME AS ABOVE wet, Dark grey, ~~[illegible]~~ ML, few silt		
50–55			11	~50%		SP	SAME AS ABOVE medium Dense — harder drilling —		
55–60			12	~70%	Coal →	SP / NRD	SAME AS ABOVE; thin ~~Coal~~ lignite stream @ ~58.5' ~~[illegible]~~ Bgs — harder drilling —		

NOTES: Very dark Brown Clay on Augers ~ 57' Bgs, medium plasticity

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954141

C-26

00321742

AECOM

Client: USACE		50WW14 ~~50WW02~~ BORING ID: 50DPT03
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 4 of 4
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: / Logged By: M. Law	Date/Time Started:	Depth of Boring:
Drilling Contractor: / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6"~~	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
61		0.2'	13	~100%	Coal →	~~Coal~~ SP/CL	- thin layer of lignite @ 60' bgs - Interbedded SAND (SP) and Clay (CL) Dry/moist, dark gray, Dense to Hard, fine Sand and Clay, few Silt with Clays laminations, trace mica in Sands. more laminations with depth.	8/27/13	
63		24/40/60/75	14 (SS)	~100%		CL	LEAN CLAY (CL) Dry, very stiff, very dark gray, mostly clay, few fine Sand bands, low plasticity, trace mica.		
65							End of Boring @ 64.5' bgs		
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954142

50WW15

AECOM

Client: USACE		BORING ID: SOOPT-12 / ~~50WW T/E~~
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation:	Sheet: 1 of 2
Drilling Method: DPT		Monitoring Well Installed: No/yes
Sample Type(s): Macrocore	Boring Diameter: 2"	Screened Interval:
Weather: Sunny 82°	Logged By: M. Lew	Date/Time Started: 7/23/13 0945	Depth of Boring: 25'
Drilling Contractor: Fugro	Ground Elevation:	Date/Time Finished: 7/25/13	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
0–5		0' – 5'	1	~60%		ML	SILT (ML) (0-5') Dry, Dark yellowish Brown grading to brownish yellow, mostly silt, fine grain, non-plastic, trace fine sand at last foot of sample.		
5–10		5'	2	100%		CL	LEAN CLAY (CL) (5'-14.5') Dry, grey with Red mottling, mottling changes to Brown @ 7' bgs, then black @ 7.5' bgs. Fine grain, mostly clay, trace silt, ~~med~~ medium plasticity, very stiff		
10–15		14.5'	3	100%		CL Fe Fe Fe SP	SAME AS ABOVE no mottling, hematite and water staining @ 13' bgs Poorly Graded Sand with Silt (SP) (14.5'-21.5) Dry to moist, grey to Brown, fine grain, mostly fine sand, little silt, non-plastic		
15–20			4				SAME AS ABOVE moist		

NOTES:

Checked by: Date:

Date	Time	Depth to groundwater while drilling

5OWW15

AECOM	Client: USACE	BORING ID: 50DPT-11 / ~~50WWT11~~
	Project Number:	Sheet: 2 of 2
	Site Location: Site 50	
	Coordinates: / Elevation:	Monitoring Well Installed:
	Drilling Method: DPT	
	Sample Type(s): / Boring Diameter:	Screened Interval:
Weather: Sunny 82°	Logged By: M. Lew / A 3rd / Date/Time Started:	Depth of Boring:
Drilling Contractor: Fugro	Ground Elevation: / Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
20–22						SP	POORLY GRADED SAND WITH SILT (SP) (14.5 - 22.5) moist to ~~damp~~ wet, grayish brown, mostly fine sand, little silt, nonplastic		
22–23		-21.5' -23'	5	~75%		CL	LEAN CLAY (CL) (22.5 - 23) moist, purplish gray, mostly clay, few silt, trace mica, low plasticity		
23–25						SP	POORLY GRADED SAND WITH SILT (SP) (23 - 25) moist, ~~brown~~ Brown, mostly fine sand, little silt, trace mica, non-plastic		
25–26							End of Soil Boring @ 25' bgs		
26–30			6	100%		SP	Poorly GRADED SAND WITH SILT (SP) (25-30) Wet to moist, loose, Dark yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, iron oxide staining between 27-29	11/8/13	
30–35			7	95%			SAME AS ABOVE 32-32.4 ft iron oxide staining with cementation, moist ~~At 35 ft~~ thin clay stringers ~ 34 ft. End of Boring at 35'		
35–40			~~8~~	~~100%~~			~~SAME AS ABOVE~~ ~~35.5-36.2 Cemented sand, iron oxide? Black in color, moist~~ ~~37-40 37-40 lamination of silt~~ ~~-Color change at 40 ft to dark gray~~		

Date	Time	Depth to groundwater while drilling

NOTES: Hydropunch sampler screen interval: 26'-31' bgs

Checked by: Date:

00321745

50WW16

AECOM

Client: USACE		BORING ID: 50DPT-5/ ~~50WWP~~
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation:	Sheet: 1 of 2
Drilling Method: DPT / HSA		Monitoring Well Installed: Yes
Sample Type(s): MacroCore / Mills Barrel	Boring Diameter: 2"/8"	Screened Interval: 20'-35'
Weather: Cloudy 78	Logged By: M. Lew	Date/Time Started: 7/26/12 0845	Depth of Boring: 25'/35'
Drilling Contractor: Fugro / TSS	Ground Elevation:	Date/Time Finished: 7/26/12 0926	Water Level: 18.5'

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
0–5		0' – 0.5' – 5'	1	~90%		CL / SP	LEAN CLAY (CL) (0 - 0.5') Dry, very dark grayish brown, mostly clay, few silt, low plasticity. POORLY GRADED SAND with Silt (SP) (0.5' - 4.5') Dry to moist, dark yellowish brown, mostly fine sand, little silt, nonplastic, trace black inclusions		
5–10.5		5' – 9.5' – 10.5'	2	~50%		CL / SP	LEAN CLAY (CL) (4.5' - 5') Dry, dark grayish brown with reddish brown mottles, fingui trace fine sand. medium plasticity. POORLY GRADED SAND with SILT (SP) (5' - 9.5') Dry to moist, yellow, mostly fine sand, little silt, nonplastic,		
10.5–15		10.5'	3	~75%		CL / SP	LEAN CLAY (CL) (9.5' - 10.5') Dry, light gray with brown mottles, few fine sand, low plasticity. POORLY GRADED SAND with Silt (SP) (10.5' - 20') Dry to moist, light gray to yellowish brown, mostly fine sand, little silt, trace mica. non-plastic		
15–20		20'	4	~75%			SAME AS ABOVE		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by ______ Date: ______

C-30

00954145

50WW16

AECOM

Client: USACE	BORING ID: SODPT-5 / ~~SOWW16~~
Project Number:	
Site Location: Site 50	
Coordinates: / Elevation:	Sheet: 2 of 2
Drilling Method:	Monitoring Well Installed: Yes
Sample Type(s): / Boring Diameter: 8"	Screened Interval: 20-35'
Weather: / Logged By: M. Low, A Smith / Date/Time Started:	Depth of Boring: 35'
Drilling Contractor: / Ground Elevation: / Date/Time Finished:	Water Level:

20

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
21–25		20.5'; 24'	5	91%		ML; SP	~~Poor~~ SANDY SILT (ML) (20-20.5) wet, Greyish yellowish Brown, mostly silt, little fine sand, slightly plastic. thin grey clay at top. POORLY GRADED SAND with SILT (SP) (20.5'-25') wet to moist, yellowish Brown, mostly fine sand, little silt, non-plastic, sandstone fragment @ 24' (concretion?) - DPT -		
26–30		26–30	6	100%		SP	End of Boring @ 25' Bgs. - HSA - Drilling ~~moist to~~ POORLY GRADED SAND WITH SILT (SP) Wet to moist, yellowish brown, mostly fine sand, trace mica, non-plastic, silt banding throughout about 1/4" thick, medium density. Near cemented sand from 27.5' to 28.5'. Some organic streaking at 27 feet. 27.5 Color Change to dark yellowish brown and Silt banding stopped.	4/10/13	
31–35			7	70%		SP	POORLY GRADED SAND WITH SILT (SP) Wet to moist, yellowish brown, mostly fine sand. Non-plastic, loose. Very little silt until about 1.5 feet down when silt banding begins at about 1/8" thickness and 3/4" thickness of Sandy silt. End of boring @ 35 feet		
36–40									

NOTES: Hydropunch set @ 26'-30' Bgs

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00321747

50WW17

AECOM

Client: USACE			BORING ID: ~~50WW6~~
Project Number: 60251135			
Site Location: Site 50			
Coordinates:	Elevation		Sheet 1 of 4
Drilling Method: HSA			Monitoring Well Installed: yes
Sample Type(s): Mills Rowe/	Boring Diameter: 8"		Screened Interval:
Weather: Sunny	Logged By: A. Law	Date/Time Started: 9/6/13 0750	Depth of Boring: 65'
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished: 9/6/13 1412	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6"~~	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
1–5			1	~30%		CL	LEAN CLAY (CL) very stiff, Dry, Red with Brownish yellow mottles, mostly clay, few fine sand, medium plasticity		
5–8.5		5'	2	~80%		SP	POORLY GRADED SAND WITH SILT (SP) (5-8.5') Loose, Dry, Brownish yellow, mostly fine sand, little silt, trace mica, non-plastic		
8.5–12		8.5'				CL	LEAN CLAY with SAND (CL) (8.5' - 12') medium stiff, Dry, Brownish yellow with grey mottles, mostly clay, little fine sand, low plasticity.		
12–15		12'	3	~100%		CL	LEAN CLAY (CL) (12' — 22.5') Very stiff, moist, grey with yellowish Brown mottles, medium plasticity, trace fine sand in mottles.		
15–20			4	~100%			SAME AS ABOVE ~~Some~~ fine sand Bands throughout, becoming more grey with depth.		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954147

C-32

00321748

50WW17

AECOM

Client: CESACE			BORING ID: ~~50WW8~~
Project Number: 60256135			Sheet 2 of 4
Site Location: Site 50			Monitoring Well Installed:
Coordinates:	Elevation		Screened Interval:
Drilling Method:			Depth of Boring:
Sample Type(s):	Boring Diameter:		Water Level:
Weather:	Logged By:	Date/Time Started:	
Drilling Contractor:	Ground Elevation:	Date/Time Finished:	

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6"~~	Recovery (%)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
21						CL	LEAN CLAY (CL) soft, Dry, gray, mostly clay, few fine sand, low plasticity		
22			5	~90%					
23		22.5'				ML	SILT (ML) (22.5'-24') soft, Dry, gray, mostly silt, trace clay, non-plastic laminated.		
24		24'				Fe SP Fe	POORLY GRADED SAND with SILT (SP) (24'- medium Dense, Dry, yellowish Brown, mostly fine sand, little silt, trace mica, non-plastic, trace iron oxide staining @ 24' bgs.		
25									
26									
27									
28			6	~85%		SP	SAME AS ABOVE loose, wet to moist @ 30'		
29									
30									
31									
32			7	~60%		SP	SAME AS ABOVE wet to moist, pale brown		
33									
34						Fe Fe Fe	- Iron oxide staining @ 34' bgs -		
35									
36		36'					- Color change @ 36' bgs to grey -		
37									
38			8	~80%		SP			
39									
40									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954148

C-33

50WW17

AECOM

Client:		BORING ID: ~~50WW6~~
Project Number:		
Site Location:		
Coordinates:	Elevation	Sheet 3 of 4
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6~~	Recovery (~~inches~~) %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
41						SP	POORLY GRADED SAND with Silt (SP)		
42			9	~70%			loose, wet, Gray, mostly fine sand, little Silt, trace mica, non-plastic		
43									
44									
45									
46									
47							SAME AS ABOVE		
48			10	~50%			medium dense,		
49									
50									
51									
52									
53			11	~30%		SP	SAME AS ABOVE		
54							dense,		
55									
56									
57							SAME AS ABOVE		
58			12	~30%			medium dense, trace Black organic banding.		
59									
60									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00321750

50WW17

AECOM	Client: USACE		BORING ID: ~~50WW~~
	Project Number: 60256135		
	Site Location: Site 50		
	Coordinates:	Elevation	Sheet 4 of 4
	Drilling Method:		Monitoring Well Installed:
	Sample Type(s):	Boring Diameter:	Screened Interval:
Weather:	Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor:	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6"~~	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
61						SP	POORLY GRADED SAND WITH SILT (SP) medium dense, wet, gray, mostly fine sand, little silt, trace mica, non-plastic, trace black organic banding.		
62									
63			13	50%					
64									
65							End of Boring @ 65' bgs		
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00321751

50WW18

AECOM

Client: USACE		BORING ID: ~~50WW14~~ 50WW18
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 1 of 2
Drilling Method: HSA		Monitoring Well Installed: yes
Sample Type(s): Milk Barrel	Boring Diameter: 8"	Screened Interval: 20'-35'
Weather: Sunny / Logged By: M. Law	Date/Time Started: 9/7/13 0836	Depth of Boring: 35'
Drilling Contractor: TSS / Ground Elevation:	Date/Time Finished: 9/7/13 1126	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6"~~	Recovery ~~(inches)~~ %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
1						ML	SILT (ML) (0-9')		
2			1	~50%			Stiff, Dry, Brownish yellow, mostly silt, few very fine sand, non-plastic, trace roots		
3									
4									
5									
6									
7		-7'-					- increasing sand content @ 7' bgs, little sand -		
8			2	~80%					
9		-9'-							
10						CL	LEAN CLAY with SAND & SILT (CL) (9'-18')		
11						CL	Stiff, Dry, light gray with Brown mottles, mostly clay, little fine sand & silt, low plasticity.		
12							SAME AS ABOVE		
13			3	~100%			light bluish gray with Brown & Brownish yellow Horizontal Banding, medium plasticity, trace silt, trace Black spotting.		
14									
15									
16						CL			
17						Fe Fe Fe			
18		-18'-	4	~130%		FeFe			
19						SP	POORLY GRADED SAND WITH SILT (SP)		
20							loose, moist, very pale Brown, mostly fine sand, little silt, non-plastic, trace mica. - Iron Oxide staining & concentrations @ 18' & 17.5' bgs -		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954151

C-36

00321752

50WW18

AECOM

Client: USACE		BORING ID: ~~50WW14~~
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 2 of 2
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: / Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6~~	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
21						SP	POORLY GRADDED SAND WITH SILT (SP) loose, wet, Brown, mostly fine sand, little silt, trace mica, non-plastic, trace thin clay stringer @ 20.5' bgs		
22			5	~100%					
23									
24									
25									
26						0000	- thin (0.2') band of sandy gravel @ 26' bgs - gravel is rounded (10 mm), dark yellowish Brown, channel bed marker?		
27									
28			6	~100%					
29									
30									
31						SP	~~POORLY GRADDED SAND WITH~~ SAME AS ABOVE		
32									
33			7	~70%			trace clay stringer @ 34.5' bgs, trace iron oxide staining at 34.5' & 33.5' bgs		
34									
35							End of Boring @ 35' bgs		
36									
37									
38									
39									
40									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954152

50WW19

AECOM

Client: USACE		BORING ID: 50DPT-10
Project Number: 60256135		Sheet: 1 of 4
Site Location: Site 50		Monitoring Well Installed: ~~No~~ Yes
Coordinates:	Elevation:	Screened Interval:
Drilling Method: DPT/HSA		
Sample Type(s): Macro Core/miller Bowl	Boring Diameter: 2"/8"	
Weather: Sunny 88°	Logged By: M. Law	Date/Time Started: 7/28/13 1425	Depth of Boring: 50'/65'
Drilling Contractor: Fugro/TSS	Ground Elevation:	Date/Time Finished: 7/25/13 1130	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
1						CL	LEAN CLAY (CL) (0 - 4.5')		
2			1	~80%			Dry, strong Brown, mostly clay, few silt, low plasticity, soft		
3							SAME AS ABOVE yellowish Red to dark yellowish Brown		
4							- increasing sand content -		
5		4.5'				SP	POORLY GRADED Sand with Silt (SP) @ 4.5' -		
6							Brown, mostly fine sand, little silt, Black spotting, moist, non-plastic		
7			2	~70%			- Becomes damp @ 7' bgs -		
8									
9		9'				SP	- 2" clean yellowish Brown fine sand @ 8.5' bgs -		
10		9.75'				CL / SP	LEAN CLAY (CL)		
11						CL	moist, light gray bluish/greenish with light Brown + Black mottles, mostly clay, few fine sand, medium plasticity, very stiff. - 3" fine sand lense @ 9.75' bgs -		
12							- interbedding with sand @ 11' bgs -		
13			3	~100%					
14									
15		15'							
16							- driller notes harder drilling -		
17			4			NR	No Recovery - softens up -		
18									
19									
20		20'							

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

50WW19

AECOM

Client: USACE		BORING ID: SOBPT-10/ ~~SOWWI~~
Project Number:		
Site Location: Site 50		Sheet: 2 of 4
Coordinates:	Elevation:	Monitoring Well Installed:
Drilling Method:		Screened Interval:
Sample Type(s):	Boring Diameter:	
Weather: Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: Ground Elevation:	Date/Time Finished:	Water Level:

20

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
21						CL	LEAN CLAY (CL) (20'-22') Dry to moist, gray, few brown mottles, very stiff, medium plasticity		
22		22'	5	~60%		SP	POORLY GRADED SAND WITH SILT (SP) (22'-27.5') moist, yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, trace beads of gray clay		
23–25									
26		26.25'	6	~80%		Fe ~~Fe~~	- iron staining and concretions @ 26.25' bgs -		
27		27.5'							
28		28.5'	7	~100%		CL/SP	INTERBEDDED LEAN CLAY (CL) & POORLY GRADED SAND WITH SILT (SP) (27.5 - 28.5') moist, light bluish/greenish gray CLAY, medium to low plasticity with light brown, fine sand, trace mica.		
29–30						SP	POORLY GRADED SAND WITH SILT (SP) 28.5'- wet to moist, yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, medium dense.		
31–35			8	~60%					
36–37			9	~60%			SAME AS ABOVE denser, yellowish brown, iron staining @ 36.5' bgs		
38–39		39.25'	10	~50%					
40						SP	SAME AS ABOVE, soft, gray, trace black banding, trace clay		

NOTES: Hydro punch screen interval set @ 26'-30' bgs

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00321755

50WW19

AECOM	Client: USACE		BORING ID: 50DPT-10 ~~50WW1~~
	Project Number:		
	Site Location: Site 50		
	Coordinates:	Elevation:	Sheet: 3 of 4
	Drilling Method:		Monitoring Well Installed:
	Sample Type(s):	Boring Diameter:	Screened Interval:
Weather:	Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor:	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows/6"~~ push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft)
40									
41			11	~96%		SP	POORLY ~~GRADED~~ SAND with SILT (SP) Damp to moist with depth, Dark gray, mostly fine sand, little silt, trace clay, non-plastic, trace mica.		
42									
43									
44			12	~50%			SAME AS ABOVE		
45									
46		46'					– Black banding organics & few lignite fragments. @ 46' Bgs –		
47									
48			13	~95%					
49									
50							End of Boring @ 50' Bgs — Continue w/ HSA –		
51						SP	SAME AS ABOVE wet to moist, gray, mostly fine sand, little silt, trace mica.	9/4/13	
52							– Black organics & lignite @ 52' Bgs –		
53			14	~80%					
54									
55		54.5'					– Increasing clay content below 54.5' Bgs – stringers, slightly-plastic.		
56						SP	~~Poorly~~ SAME AS ABOVE		
57									
58			15	~65%			– organics @ 58.4' Bgs thin bands		
59									
60									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954155

C-40

00321756

50WW19

AECOM

Client: USACE			BORING ID: ~~50DPT-10~~/ 50DPT-10
Project Number: 60256135			
Site Location: Site 50			
Coordinates:	Elevation		Sheet 4 of 4
Drilling Method: HSA			Monitoring Well Installed:
Sample Type(s): Milk Barrel	Boring Diameter:		Screened Interval:
Weather:	Logged By: M. Lee	Date/Time Started:	Depth of Boring:
Drilling Contractor:	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run ~~Blows per 6"~~	Recovery ~~(inches)~~ %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
61						SP	POORLY GRADED SAND WITH SILT (SP) ~~Brown~~, moist, grey, mostly fine sand, little silt, trace Mica, non-plastic, trace sand filled Burrows @ 63.5' Bgs, fill sand is pale Brown.		
62			16	~50%					
63									
64									
65		Run					End of Boring @ 65' Bgs		
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954156

C-41

00321757

50WW20

AECOM

Client: USACE	BORING ID: ~~50BP07~~
Project Number: 60256135	
Site Location: Site 50	
Coordinates: Elevation:	Sheet: 1 of 3
Drilling Method: DPT	Monitoring Well Installed: No
Sample Type(s): MacroCore Boring Diameter: 2"	Screened Interval:
Weather: Cloudy 77 Logged By: M. Law Date/Time Started: 7/24/13 0850	Depth of Boring: 35'
Drilling Contractor: Fugro Ground Elevation: Date/Time Finished:	Water Level: 23.40

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Run	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
		0.25'				ML	SILT (ML) (0 - 0.25')		
1							Dry, Brown, mostly silt, trace clay, non-plastic		
						CL	LEAN CLAY (CL) 0.25' -		
2			1	~90%			Dry, gray with Red to Brown mottles with depth,		
3							mostly clay, medium plasticity, very stiff below 1.5' bgs		
4									
5									
6							SAME AS ABOVE		
7		7'					trace sand, black mottles, softer		
						SP	- 2" Sand lense @ 7' bgs POORLY GRADED SAND with Silt (SP)		
8			2	~100%		CL	Reddish Brown, fine grain, non-plastic,		
9		9.5'				SP	POORLY GRADED SAND (SP) (9.5' - 9.75')		
10		9.75'				CL	Dry, tan yellow, mostly fine sand, non-plastic		
11							LEAN CLAY with SAND (CL) (9.75' - 15.5')		
12							Dry, Gray with Brown & Black mottles, very stiff to		
13			3	~100%			Stiff with Depth, Low plasticity		
14									
15									
16		15.5'				SP	POORLY GRADED SAND with SILT (SP) (15.5' - 16.5')		
		16.5'					Dry to moist, Yellowish Gray, mostly sand, little silt, fine grain, non-plastic.		
17			4	~70%		CL	LEAN CLAY WITH SAND (CL) (16.5 - 19')		
18							AS ABOVE		
19		19'				SP	POORLY GRADED SAND WITH SILT (SP) (19 -		
20							moist, yellowish Brown, mostly fine sand, little silt, non-plastic		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by Date

00954157

C-42

00321758

50WW20

AECOM

Client: USACE
Project Number:
Site Location: Site 50
Coordinates:
Elevation:
Drilling Method: DPT
Sample Type(s):
Boring Diameter:

BORING ID: ~~50...~~ 07
Sheet: 2 of 3
Monitoring Well Installed:
Screened Interval:
Depth of Boring:
Water Level:

Weather: Sunny 77
Drilling Contractor: Fuge
Logged By: M. Law
Ground Elevation:
Date/Time Started:
Date/Time Finished:

20

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
21–25		~22' ; ~24'	5	~75'		SP; FeFe; FeFeFe	POORLY GRADED SAND with SILT (SP) (19'–29') moist, Light Reddish Brown, mostly Sand, little Silt, Fine-grain, nonplastic, hematite concentrations @ 22' + 24' bgs, few mica. – color changes back to yellowish Gray below 24' bgs –		
25–30		~29'	6	~60%			SAME AS ABOVE moist light Brown gray grading to reddish Brown near 29' bgs		
30–35			7	~100%		CL; FeFeFe; SP; FeFeFe; FeFe; FeFe	LEAN CLAY (CL) (29'–30') moist, soft, Gray, mostly clay, ~~...~~ iron staining and hematite concentrations above and below clay layer. POORLY GRADED SAND with SILT (SP) (30'–31.5') Damp, ~~tan~~ Brownish Gray, mostly Sand, little Silt, trace fine Clay, slightly plastic. SAME AS ABOVE ~~...~~ moist, Brownish Gray, mostly sand, little silt, nonplastic fine-grain, Iron Hematite concentrations from 33' to 34.5' bgs		
35–40		~~35'~~ 35.5'	8	~60%		~~...~~ SP	~~LEAN CLAY (CL) (35–35.5)~~ MC		
							SAME AS ABOVE trace mica, yellowish Brown with few gray laminations		

NOTES: Hydropunch sample @ 36'–39' (First water)

Date	Time	Depth to groundwater while drilling

Checked by
Date:

00954158

C-43

00321759

50WW20

AECOM	Client: US ACE	BORING ID: ~~SAPP107~~
	Project Number:	
	Site Location: Site 50	
	Coordinates: Elevation:	Sheet: 3 of 3
	Drilling Method:	Monitoring Well Installed:
	Sample Type(s): Boring Diameter: 2"	Screened Interval:
Weather:	Logged By: M. LAW / Date/Time Started:	Depth of Boring:
Drilling Contractor:	Ground Elevation: / Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
40						SP?	POORLY GRADED SAND WITH SILT (SP)		
41							~~Dam~~ Wet to ~~moist~~ yellowish Brown, mostly sand, little silt, trace clay, a grades Brown to Yellowish Brown @ 45' bgs		
42			9	5%		NR	– description from top and bottom of core –		
43							– hard drilling @ ~ 43' bgs		
44									
45		45'				SP?			
46			10	~100%		SP	SAME AS ABOVE		
47		47'				Fe Fe Fe	– iron concentration nodule @ 47' (hematite?) –		
48							SAME AS ABOVE moist, Olive with Brown Laminations, no clay		
49		49'	11	~100%					
50						SP	POORLY Graded SAND (SP) (49'–53') with Silt moist, Grey, mostly fine sand, few silt, trace mica, non-plastic, few Black bands in laminations (organics?), wet below 53' bgs.		
51		51.5'							
52		52.5'	12	70%			Black laminations @ 51.5' & 52.5' (Lignite? organics)		
53		53'					– Increasing clay content –		
54						CL	LEAN CLAY (CL) Dry, Dark Gray, mostly clay, trace mica, Low plasticity, very stiff		
55		55'				SP	– thin gray, fine sand lenses @ 54.5' bgs –		
56						CL/SP	Interbedded LEAN CLAY (CL) and POORLY GRADED SAND with Silt (SP)		
57			13	71%			Dry, Dark Gray, mostly clay, some fine sand interbedded, around 2" thick, medium plasticity, very stiff		
58							– continued hard Drilling –		
59									
60							End of Boring @ 60' bgs		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by Date:

00954159

C-44

00321760

50WW21

AECOM

Client: USACE		**BORING ID:** ~~50WWX/S~~
Project Number: 60256135		Sheet: 1 of 2
Site Location: Site 50		Monitoring Well Installed: yes
Coordinates:	Elevation:	Screened Interval: 20-35'/45'-60'
Drilling Method: HSA	Boring Diameter: 8"	Depth of Boring: 35'/60'
Sample Type(s): Mills Cont. barrel		Water Level:
Weather: Sunny 95°	Logged By: M. Law	Date/Time Started: 8/23/10 1535
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Runs	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
0		0.5'				ML	SILT (ML) (0-0.5') Dry, Pale Brown, mostly silt, few fine sand, nonplastic, roots		
1–5			1	~95%		CL	LEAN CLAY (CL) (0.5'-5') Very Stiff, Dry, 10YR 7/? with red mottles, mostly clay, few silt, low to medium plasticity.		
5							- increasing sands @ 4' bgs, Brown mottling instead of Red in clay.		
5–10			2	~23%		NR	- light gray fine sand from cuttings -		
9–10						CL	LEAN CLAY WITH SAND (CL) Stiff, Dry, yellowish Brown grading to light Gray, mostly clay, little fine sand, few silt, low plasticity.		
10–15			3	~40%		NR			
13						SP	POORLY GRADED SAND (SP) Dry, Pale Brown to Very Pale Brown, mostly fine sand, trace silt, nonplastic, few clay bands, Reddish Brown, low plasticity -Iron oxide staining Above clay -		
14.5						CL	LEAN CLAY (CL) Moist, light gray, mostly clay, low plasticity		
15–20			4	~30%		SP	POORLY GRADED SAND (SP) Moist, Pale yellow, mostly fine sand, few silt, nonplastic, some laminations		
19							- Becoming wet below 19' bgs -		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by Date:

00954160

C-45

00321761

50WW21

AECOM	Client: USACE	BORING ID: ~~50WW~~/5
	Project Number: 60256135	
	Site Location: Site 50	
	Coordinates: Elevation:	Sheet: 2 of 2
	Drilling Method:	Monitoring Well Installed:
	Sample Type(s): Boring Diameter:	Screened Interval:
Weather:	Logged By: M. Law / Date/Time Started:	Depth of Boring: 35'
Drilling Contractor:	Ground Elevation: / Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Run	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
20–25			5	~91%		SP	POORLY GRADED SAND with SILT (SP) moist to wet, yellowish Brown, mostly fine sand, little silt, non-plastic, few thin laminations, thin iron oxide bands @ 23' & 25' bgs		
25–30			6	~90%			SAME AS ABOVE light Olive Brown, trace mica		
30–35			7	~70%			SAME AS ABOVE wet to moist @ 34' bgs		
35–40		35.5'	8	~80%		CL / SP	End of Boring @ 35' bgs. LEAN CLAY WITH SAND (CL) (35'-35.5') soft, moist, yellowish red, with light Olive Brown mottles of fine sand, mostly clay, little fine sand, low plasticity. POORLY GRADED SAND WITH SILT (SP) loose to dense, wet, light Olive Brown, mostly fine sand, little silt, trace mica, thin silt laminations	9/8/13	

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954161

50WW22

AECOM

Client: USACE		BORING ID: 50DPT-8/ ~~50WWL~~
Project Number: 60256175		
Site Location: Site 50		
Coordinates:	Elevation:	Sheet: 1 of 2
Drilling Method: DPT/HSA		Monitoring Well Installed: Yes
Sample Type(s): Macrocore	Boring Diameter: 2"	Screened Interval:
Weather: Sunny 92 / Logged By: M. Law	Date/Time Started: 7/23/13 1150	Depth of Boring: 30'/35'
Drilling Contractor: Fugro/TSS / Ground Elevation:	Date/Time Finished: 7/25/13 1642	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft)
0–1		0' – 0.5'				ML	SILT (ML) (0 - 0.5')		
1–2						CL	Dry, light Brown, mostly Silt, trace sand, non-plastic		
2–4		2.5'	1	~99%		CL	LEAN CLAY with Silt (CL) (0.5 - 2.5') Dry, Reddish Brown, mostly clay, little silt, low plasticity.		
4–7							LEAN CLAY (CL) (2.5' - 7') Dry, Very stiff, Gray with Reddish to Brown mottles, fine grain, medium plasticity.		
7–8		7' – 7.5'	2	100%		SP	POORLY GRADED SAND with Silt (SP) (7 - 7.5') Dry, Yellowish Brown, mostly fine sand, little silt, fine grain non-plastic		
8–10						CL	LEAN CLAY with Sand (CL) (7.5' - 10') Dry, gray with Brown mottles, mostly clay, little sand fine grain, low plasticity.		
10–12.5		10'				CL	LEAN CLAY (CL) (10' - 12.5') Dry, very stiff, Gray with Brown mottles, mostly Clay trace sand, fine grain, medium plasticity.		
12.5–15		12.5'	3	100%		CL	SAME AS ABOVE (12.5' -) Black & Brown mottles		
15–16.5		15'				SP	Poorly GRADED SAND with Silt (SP) (15' - 16.5') Dry to moist, gray, mostly sand, little silt, fine grain, non-plastic.		
16.5–18		16.5'	4	100%		CL	LEAN CLAY (CL) (16.5 - moist, Brown, mostly Clay, trace silt, medium Plasticity		
18–19		18' – 18.5'				CL	3" Purple staining @ 18 ?bgs, Laminations. CLAYEY Silt. Brown ~~Laminated Clays below~~		
19–20						SP	Poorly Graded Sand with Silt (SP) (18.5' -) Laminated AS ABOVE		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by ______ Date: ______

50WW22

AECOM	Client: USACE	BORING ID: 50DPT-8/ ~~50WWL~~
	Project Number:	
	Site Location: Site 50	
	Coordinates: Elevation:	Sheet: 2 of 2
	Drilling Method: DPT	Monitoring Well Installed:
	Sample Type(s): Boring Diameter:	Screened Interval:
Weather: Sunny 92	Logged By: M. Lew / Date/Time Started:	Depth of Boring:
Drilling Contractor: Fugro	Ground Elevation: / Date/Time Finished:	Water Level:

20'

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
21						SP	POORLY GRADED SAND with SILT (SP) moist to damp, yellowish Brown, mostly fine sand, little silt, non-plastic, few laminations		
22			5	~80%					
23									
24									
25							SAME AS ABOVE moist,		
26									
27			6	~80%					
28									
29									
30							End of DPT Boring @ 30' bgs -DPT- -HSA-		
31							POORLY GRADED SAND with SILT (SP)	8/23/13	
32							moist, yellowish Brown, mostly fine sand, little silt, non-plastic, trace iron oxide Banding, trace mica.		
33			7	~70%					
34									
35							— Iron oxide banding @ 34.5' bgs —		
36							End of HSA Boring @ 35' bgs		
37									
38									
39									
40									

NOTES: Hydropunch sampler screen interval 31 - 35' bgs

Date	Time	Depth to groundwater while drilling

Checked by Date:

00321764

50WW23

AECOM	Client: USACE		BORING ID: ~~50WW-M~~
	Project Number: 60256175		
	Site Location: Site 50		
	Coordinates:	Elevation	Sheet 1 of 2
	Drilling Method: HSA		Monitoring Well Installed: Yes
	Sample Type(s): Mill Barrel	Boring Diameter: 8"	Screened Interval: 20'-35'
Weather: Sunny	Logged By: M. Law	Date/Time Started: 8/25/13 0740	Depth of Boring: 35'
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished: 8/25/13 0908	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run ~~Blows per 6"~~	Recovery (~~inches~~) %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
0.5	- 0.5' -					ML	SILT (ML) (0'-0.5') Dry, soft, pale Brown, mostly silt, few fine sand, non-plastic, trace roots.		
1–5			1	~20%		CL	LEAN CLAY (CL) (0.5'-5') Dry, very stiff, Reddish Brown with Gray mottles, mostly clay, trace fine sand, medium plasticity.		
5–10	- 5' -		2	100%		CL	~~SAME AS~~ AL LEAN CLAY WITH SAND (CL) (5'-15') Dry, very stiff, Olive yellow, mostly clay, some fine sand, low plasticity.		
10–15			3	~45%			SAME AS ABOVE Dry to moist, stiff, light yellowish Brown with light Reddish Brown sand lenses, mostly clay, some fine sand, low plasticity, trace mica — thin iron oxide band @ 14.5' bgs —		
15–20	- 15' -		4	~80%		SP	POORLY GRADED SAND WITH SILT (SP) moist, ~~fine~~ loose light olive Brown, with bluish Gray banding @ 18' bgs, non-plastic, mostly fine sand, little silt, trace clay. - iron oxide staining & cementation @ 19.5' bgs -		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954164

C-49

00321765

50WW23

AECOM

Client: USACE		BORING ID: ~~50WW11~~
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 2 of 2
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: / Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run ~~Blows per 6"~~	Recovery ~~(inches)~~ %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
21						SP	POORLY GRADED SAND WITH SILT (SP)		
22			5	~80%			moist, ~~dusty~~ loose light olive Brown, mostly fine sand, little silt, trace clay stringers, trace mica, non-plastic. ~~thin traces~~ Black laminations throughout		
23									
24									
25									
26							SAME AS ABOVE		
27			6	~70%			fewer laminations		
28									
29							- clay stringer @ 29' bgs, with some iron oxide staining -		
30						SP			
31									
32									
33			7	~50%		CL	- 0.4' thick LEAN CLAY (CL) - moist, light Bluish Gray, Low plasticity Black laminations above and below clay layer.		
34						SP			
35							End of Boring @ 35' bgs		
36									
37									
38									
39									
40									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954165

C-50

00321766

50WW24

AECOM

Client: USACE		BORING ID: ~~50WW0N~~ 50WW24
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 1 of 2
Drilling Method: HSA		Monitoring Well Installed: Yes
Sample Type(s): Mill bowl	Boring Diameter: 8"	Screened Interval: 20-35'
Weather: Sunny 80° / Logged By: M. Law	Date/Time Started: 8/24/13 1105	Depth of Boring: 35'
Drilling Contractor: TSS / Ground Elevation:	Date/Time Finished: 8/24/13 1146	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run ~~Blows per 6"~~	Recovery ~~(inches)~~ %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
1		1'				ML	SILT (ML) (0-1') Dry, Pale Brown, mostly silt, few fine sand, trace roots, non-plastic		
2			1	~50%					
3						CL	LEAN CLAY (CL) (1-2.5') Dry, very stiff, Red with light brownish gray mottles, mostly clay, trace fine sand, ~~to~~ medium plasticity		
4						NR			
5									
6						CL	LEAN CLAY with sand (CL) (5'- Dry to moist, stiff, light olive Brown, mostly clay, little fine sand, low plasticity.		
7									
8			2	~70%					
9									
10									
11									
12						CL	SAME AS ABOVE moist, medium stiff, light yellowish Brown, with Brown mottles, mostly clay ~~trace~~ some fine sand, low plasticity, trace silt		
13			3	~50%					
14							--increasing sand content -		
15									
16						SP	POORLY GRADED SAND (SP) Dry to moist (@ 19.5' bgs), yellowish Brown, with light gray bands, non-plastic, trace oxide staining at Bottom of core		
17			4	~60%					
18									
19									
20									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00321767

50W W24

AECOM

Client: USACE
Project Number: 60256125
Site Location: Site 50
Coordinates:
Elevation
Drilling Method:
Sample Type(s):
Boring Diameter:
Weather:
Logged By:
Date/Time Started:
Drilling Contractor:
Ground Elevation:
Date/Time Finished:

BORING ID: ~~50WW24~~
Sheet 2 of 2
Monitoring Well Installed:
Screened Interval:
Depth of Boring:
Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Rig ~~Blows per 6"~~	Recovery (~~inches~~) %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
21						SP	POORLY GRADED SAND (SP) moist, medium dense, yellowish Brown, mostly fine sand, few silt, non-plastic, trace mica		
22			5	~80%					
23									
24							- Iron Oxide staining @ 24.5' Bgs		
25									
26							SAME AS ABOVE		
27							wet to moist @ 27' Bgs,		
28			6	~60%					
29									
30									
31							SAME AS ABOVE		
32									
33			7	~100%					
34									
35							End of Boring @ 35' Bgs		
36									
37									
38									
39									
40									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by:

Date:

00954167

00321768

50WW25

AECOM

Client: USACE		BORING ID: SODPT-11 / ~~50WW~~
Project Number: 60256135		Sheet: 1 of 3
Site Location: Site 50		Monitoring Well Installed: Yes
Coordinates:	Elevation:	Screened Interval: 45'-55'
Drilling Method: DPT/HSA	Boring Diameter: 2"/8"	Depth of Boring: 20'/55'
Sample Type(s): Macrocore/Mills barrel	Date/Time Started: 7/26/13 1011	Water Level: 45'
Weather: Cloudy 85	Logged By: M. Lew	
Drilling Contractor: Fugro/TSS	Ground Elevation:	Date/Time Finished: 7/26/13 1041

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~) %	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
0–1		-0.5-				ML	SILT (ML) (0-0.5') Dry, Brown, mostly silt, few fine sand, non-plastic		
1–5.5			1	~98%		CL	LEAN CLAY (CL) (0.5'-5.5') Soft, Dry, yellowish Brown, mostly clay, trace fine sand, Low plasticity. Red, Brown & Black mottles. - clay becomes stiff -		
6		-5.5-				SP	- thin, dry, fine sand lense @ 5.5' Bgs		
6–7		-7'-	2	~90%		CL	LEAN CLAY with SAND (CL) (5.5'-7') Stiff, yellowish Gray, mostly clay, little fine sand, Low plasticity		
7–11						CL	LEAN CLAY (CL) (7'- Stiff, Dry, yellowish Gray, with Brown & Black mottles, few to trace fine sand, Low ~~plasticity~~ to medium plasticity		
12		-11.5'-				SP	- thin, dry, fine sand lenses @ 11.5' & 13.5' Bgs		
12–13			3	98%		CL			
14		-13.5'-				SP			
14–17						CL	- clay becomes very stiff - - increasing fine sands -		
17		-17'-				FeFeFe			
17–20			4	~90%		SP	POORLY GRADED SAND with Silt (SP) (17'-20') Moist, yellowish Brown, mostly fine sand, little silt, trace mica, non-plastic, iron staining @ 16.75' Bgs, trace concentrations, ~~Reddish~~ Dark yellowish Brown color.		
20							End of Boring @ 20' Bgs		

NOTES: Hydro punch screen interval set @ 22'-26' Bgs

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954168

00321769

50WW25

AECOM

Client:		BORING ID: ~~50WWP~~ 50DPT-11
Project Number:		
Site Location:		
Coordinates:	Elevation	Sheet 2 of 3
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~) %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
21–25			5	50%		SM	SILTY SAND POORLY GRADED (SM) Wet, loose, Yellow Brown, mostly fine Sand, non-plastic. Becoming dense with depth. Oxidation layer ~~at ~23.5'~~ foot from bottom of sample with some cementation.		
24–25						CL	SANDY CLAY (CL) Wet, soft, yellow brown, mostly fine Sand, low-plasticity, trace mica		
25–30		-25'-	6	100%		SP	SAND WITH SILT (SP) Wet and becoming moist at bottom of core. loose and becoming more dense at bottom of core. Yellowish brown, mostly fine sand with interbedded clay. Clay is slightly plastic. 28-30 feet has interbedded silt.		
30–35		3	7	100%		SM / CL	INTERBEDDED SILTY SAND AND CLAY (SM/CL) Moist, loose getting more dense at the last foot, yellowish brown except 6" at 34.5' to 35' color changes to brown. Mostly fine grain sand, ~~clay is~~ low to slightly plastic. Interbedding ranges from 3" to 1/4".		
35–40			8	100%		~~SM~~ SP	SAND WITH SILT (SP) Wet to ~~slightly~~ moist towards bottom of the core, dark grayish brown, non-plastic, oxidation layers throughout excluding 37'-38', 39.8'-39' has organic ~~layers~~ streaking. 39.5-40 has clay layers. Clay has low plasticity.		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954169

C-54

00321770

50WW25

AECOM

Client:		BORING ID: 50DPT-11/ ~~50WWP~~
Project Number:		
Site Location:		
Coordinates:	Elevation	Sheet 3 of 3
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: / Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery ~~(inches)~~ %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
							SAND WITH SILT (SP)		
41–45			9	25%		SP	Same as above, wet, poorly graded. ~~One~~ Two inches of Clay shoe at bottom of Shoe, light yellowish brown followed by 1.5" of ~~lignite~~ black organics then back to the Sand with silt from above, dry.		
45–50			10	30%		ML / CL / NR	Same as above, moist		
49–50						~~[illegible]~~	THINLY LAMINATED CLAY WITH SAND Very fine sand, trace silt, dry, stiff, Clay has low plasticity, few sand, dark gray, sand lenses are gray clay		
50–55			11	90%			THINLY LAMINATED CLAY WITH SAND LENSES Low plasticity, trace sand lenses, sand is very fine, dry, dark gray clay with gray lenses.		
55							End of Boring @ 55' bgs		
55–60			12						

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954170

C-55

00321771

50WW26

AECOM	Client: USACE		BORING ID: ~~50WW-15~~
	Project Number: 60251135		
	Site Location: Site 50		
	Coordinates:	Elevation:	Sheet: 1 of 3
	Drilling Method: HSA		Monitoring Well Installed: yes
	Sample Type(s): Mills Continuous	Boring Diameter: 8"	Screened Interval: 20-35/45-60
Weather: Sunny 95°	Logged By: M. Law	Date/Time Started: 8/23/10 1535	Depth of Boring: 35'/60'
Drilling Contractor: TSS	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Runs	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
0–1		0.5'				ML	SILT (ML) (0-0.5') Dry, Pale Brown, mostly silt, few fine sand, nonplastic, roots		
1–5			1	~95%		CL	LEAN CLAY (CL) (0.5'-5') very stiff, Dry, light gray with Red mottles, mostly clay, few silt, low to medium plasticity.		
5							- Increasing sand @ 4' bgs, Brown mottling instead of Red in clay.		
5–9			2	~25%		NR	- light gray fine sand from cuttings -		
9–10		[illegible]				CL	LEAN CLAY WITH SAND (CL) Stiff, Dry, yellowish Brown grading to light Gray, mostly clay, little fine sand, few silt, Low plasticity.		
10–13		[illegible]	3	~40%		NR			
13–14.5						SP	POORLY GRADED SAND (SP) Dry, pale Brown to very Pale Brown, mostly fine sand, trace silt, nonplastic, few clay bands, Reddish Brown, low plasticity - Iron oxide staining Above Clay -		
14.5–15						CL	LEAN CLAY (CL) moist, light gray, mostly clay, low plasticity		
15–20			4	~80%		SP	POORLY GRADED SAND (SP) moist, pale yellow, mostly fine sand, few silt, nonplastic, some laminations		
19							- Becoming wet below 49' bgs -		

NOTES:

Checked by: Date:

Date	Time	Depth to groundwater while drilling

00954171

C-56

00321772

50WW26

AECOM

Client: USACE		**BORING ID:** ~~50WW~~/5
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation:	Sheet: 2 of 3
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather:	Logged By: M. Law / Date/Time Started:	Depth of Boring: 35'
Drilling Contractor:	Ground Elevation: / Date/Time Finished:	Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Run	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
20–25			5	~90%		SP	POORLY GRADED SAND with SILT (SP) moist to wet, yellowish Brown, mostly fine sand, little silt, non-plastic, few thin laminations, iron oxide bands @ 23' + 25' bgs		
25–30			6	~90%			SAME AS ABOVE light Olive Brown, trace mica		
30–35			7	~70%			SAME AS ABOVE wet to moist @ 34' bgs		
35							End of Boring @ 35' bgs		
35–40		-35.5'-	8	~80%		CL	LEAN CLAY WITH SAND (CL) (35' - 35.5') soft, moist, yellowish red, with light Olive Brown mottles of fine sand, mostly clay, little fine sand, Low plasticity	— 9/8/13 →	
						SP	POORLY GRADED SAND WITH SILT (SP) loose to Dense, wet, light Olive Brown, mostly fine sand, little silt, trace mica, thin silt laminations		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954172

C-57

00321773

50WW26

AECOM

Client: USACE		BORING ID: 50WW k/S
Project Number: 60256135		
Site Location: Site 50		
Coordinates:	Elevation	Sheet 3 of 3
Drilling Method:		Monitoring Well Installed:
Sample Type(s):	Boring Diameter:	Screened Interval:
Weather: / Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor: / Ground Elevation:	Date/Time Finished:	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Run # ~~Blows per 6"~~	Recovery (~~inches~~) %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
41–45			9	~40%		SP	POORLY GRADDED SAND WITH SILT (SP) loose, wet, light Olive Brown, mostly fine sand, little silt, trace mica, thin laminations of silt throughout.		
45–50			10	~40%			SAME AS ABOVE with two zones of iron oxide cemented sands, friable, yellowish red, moist		
50–55		50' 51.5' 52' 53'	11	~90%		SC	SANDY CLAY (SC) (50 - 51.5') soft, wet, dark gray, mostly clay, ~~little~~ some fine sand, few silt, medium plasticity, laminated.		
						CL	LEAN CLAY (CL) (51.5 - 52.0') stiff, moist, Dark Gray, mostly clay, trace fine sand, medium plasticity.		
						SP	POORLY GRADDED SAND WITH SILT (SP) (52' - 53') loose, moist, Dark Gray, mostly fine sand, little silt, trace mica, nonplastic.		
55–60			12	~40%		CL/SP ? SP	Inter-bedded CLAY and SAND (CL/SP) Dense to stiff, dry, Dark Gray, mostly LEAN CLAY (CL), some POORLY GRADDED SAND (SP), fine grain, slightly to low plasticity, trace mica in sand seams. iron oxide staining @ 55' bgs		
							POORLY GRADDED SAND WITH SILT (SP) loose, wet, dark gray, mostly sand, little silt, nonplastic, trace Black organic bands, iron oxide staining and thin clay stringers.		

End of Boring @ 60' bgs

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954173

00321774

50WW27

AECOM

Client: USACE
Project Number: 60286135
Site Location: Site 50
Coordinates:
Elevation:
Drilling Method: DPT
Sample Type(s): Macrocore
Boring Diameter: 2"

BORING ID: SDDPT-1X / ~~50WW TIE~~
Sheet: 1 of 3
Monitoring Well Installed: No / ~~yes~~
Screened Interval:
Depth of Boring: 25'
Water Level:

Weather: Sunny 82°
Drilling Contractor: Fugro
Logged By: McLaw
Ground Elevation:
Date/Time Started: 7/25/13 0945
Date/Time Finished: 7/25/13

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
0–5		0'	1	~60%		ML	SILT (ML) (0-5') Dry, Dark yellowish Brown grading to brownish yellow, mostly silt, fine grain, non-plastic, trace fine sand at last foot of sample.		
5–10		5'	2	100%		CL	LEAN CLAY (CL) (5'-14.5') Dry, grey with Red mottling, mottling changes to Brown @ 7' bgs, then black @ 7.5' bgs. Fine grain, mostly clay trace silt, medium plasticity, very stiff		
10–15		14.5'	3	100%		CL Fe Fe Fe SP	SAME AS ABOVE no mottling, hematite and water staining @ 13' bgs Poorly Graded Sand with Silt (SP) (14.5'-22.5') Dry to moist, gray to Brown, fine grain, mostly fine sand, little silt, non-plastic		
15–20			4				SAME AS ABOVE moist		

Date	Time	Depth to groundwater while drilling

NOTES:

Checked by: Date:

00954174

C-59

00321775

50WW27

AECOM

Client: USACE
Project Number:
Site Location: Site 50
Coordinates: Elevation:
Drilling Method: DPT
Sample Type(s): Boring Diameter:
Weather: Sunny 82°
Drilling Contractor: Fugro
Logged By: M. Lew/AS
Ground Elevation:
Date/Time Started:
Date/Time Finished:

BORING ID: SODPT-12/ ~~50WWPTF~~
Sheet: 2 of 3
Monitoring Well Installed:
Screened Interval:
Depth of Boring:
Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery (~~inches~~ %)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
20–22						SP	POORLY GRADED SAND WITH SILT (SP) (14.5 - 22.5) moist to ~~damp~~ wet, grayish brown, mostly fine sand, little silt, nonplastic		
22–23		-21.5' -23'	5	~75%		CL	LEAN CLAY (CL) (22.5 - 23) moist, purplish gray, mostly clay, few silt, trace mica, low plasticity		
23–25						SP	POORLY GRADED SAND WITH SILT (SP) (23 - 25) moist, ~~brown~~ Brown, mostly fine sand, little silt trace mica, non-plastic		
25–30		26–30	6	100%		SP	End of Soil Boring @ 25' bgs. Poorly ~~S~~GRADED SAND WITH SILT (SP) (25-30) Wet to moist, loose, Dark yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, iron oxide staining between 27-29	9/3/13	
30–35			7	95%			SAME AS ABOVE 32-32.4 ft iron oxide staining with cementation, moist ~~At 35 ft~~ thin clay stringers ~ 34 ft.		
35–40			8	100%			SAME AS ABOVE 35.5 - 36.2 Cemented sand, iron oxide? Black in color, moist ~~37-40~~ 37 - 40 lamination of silt -Color change at 40 ft to dark gray		

Depth scale: 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40

NOTES: Hydropunch sampler screen interval: 26'-30' bgs

Checked by Date:

Date	Time	Depth to groundwater while drilling

00954175

00321776

50WW27

AECOM

Client: USACE			BORING ID: 50DPT-12/ ~~50WWT/E~~
Project Number: 60256435			
Site Location: Site 50			
Coordinates:		Elevation	Sheet 3 of 3
Drilling Method: DPT			Monitoring Well Installed: Yes
Sample Type(s): M. Law/		Boring Diameter: 2"	Screened Interval:
Weather: Sunny 99°	Logged By: A. Smith	Date/Time Started: 7/23/13	Depth of Boring: 25'
Drilling Contractor: QRI/TSI	Ground Elevation:	Date/Time Finished: 9/09/13	Water Level:

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	~~Blows per 6"~~ Push	Recovery ~~(inches)~~ %	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
41–45			9	50%		SP	POORLY GRADED SAND (SP) Wet, dark gray, Fine sand, trace mica, loose, non-plastic 44.5' Iron oxide band 44'-45' few silt, clay stringers		
45–50			10	50%			POORLY GRADED SAND (SP) wet, dark gray, fine sand, loose, non-plastic 49.5'-50' Clay stringers, highly plastic		
50–55			11	50%		Coal	POORLY GRADED SAND (SP) Wet, dark gray, fine sand, loose, non-plastic 53' Soil becomes a bit more stiff with trace silt. 53', 10.5" lignite		
						NR	54'-55' No recovery		
55–60			12	100%		SP	50-55.5 Slough 55.5' lignite lense followed by silty clay, light gray, moist, ~~with~~ some plasticity, loose 56-60 silty clay with thinly laminated sand lenses, dry, medium plasticity, trace mica, light gray, stiff, few sand.		

NOTES: Driller believes lignite layer is about a foot thick (53'-54'). 2 inches recovered in spoon.

End of boring @ 60 ft.

Date	Time	Depth to groundwater while drilling

Checked by: Date:

00954176

00321777

AECOM

Client: USACE		**BORING ID:** 50DPT14/50WW28
Project Number: 60256135		Sheet 1 of 2
Site Location: LHAAP Site 50		Monitoring Well Installed: YES
Coordinates:	Elevation	Screened Interval: 13.9-23.9
Drilling Method: HSA	Boring Diameter: 8¼" 10¼	Depth of Boring: 24.3
Sample Type(s): 5' Core Barrel	Date/Time Started: 5/1/14	Water Level: 14.1 5/1/14
Weather: Sunny 68° / Logged By: GH + GM	Date/Time Finished: 5/6/14	
Drilling Contractor: Fugro / Ground Elevation:		

Depth (ft)	Geologic Sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)	Lab Sample ID	Lab Sample Depth (ft)
1				36"/36"		ML/SM	Sandy Silt / Silty Fine Sand, Dark Brown, moist to wet w/depth		
2					5.1		@1' Grayish Brown		
4				51"/60"	6.1				
5							@4.5' Moist		
6					7.0				
7						SP	@6' Fine Sand, light gray w/yellowish brown streaks, damp		
8					5.2				
9				60"/60"		SP	@9' Silty Clay (Gray) w/(laminations of silt (light gray)), damp, very stiff		
10					5.7	CL			
12					5.7				
14				60"/60"	4.8		@14.5' Fine Sand, strong brown, wet		
16					5.3	SP	@16' Gray w/strong brown streaks		
18					4.4		Continued drilling to 24.3' 5/6/14		
19							Sandy cuttings were observed while drilling		
20									

NOTES: @1450 on 5/1/14 water sample 50DPT14 (13-18)010514 was obtained

Date	Time	Depth to groundwater while drilling
5/1/14	1440	14.1'

Checked by: Glenn Hilton Date: 7/9/14

00954177

C-62

00321778

AECOM

Client: USACE	BORING ID: 50DPT14/50WW28
Project Number: 60256135	
Site Location: LHAAP-50	
Coordinates: / Elevation:	Sheet: 2 of 2
Drilling Method: HSA	Monitoring Well Installed: YES
Sample Type(s): 5' CORE BARREL / Boring Diameter: 8¼"	Screened Interval: 13.9-23.9'
Weather: CLEAR / Logged By: GH+GM / Date/Time Started: 5/1/14	Depth of Boring: 24.3'
Drilling Contractor: FUGRO / Ground Elevation: / Date/Time Finished: 5/6/14	Water Level: 14.1' 5/1/14

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
21							SANDY CUTTINGS OBSERVED WHILE DRILLING		
22									
23									
24							TOTAL DEPTH: 24.3' bgs		
25									
26									
27									
28									
29									
30									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by G. McDonnell Date: 7/9/14

00954178

C-63

HOLE NO. LHS-MW52

DRILLING LOG	DIVISION SOUTHWEST	INSTALLATION LHAAP	SHEET 1 OF 1 SHEETS

1. PROJECT: LHAAP-WASTE SUMPS	10. SIZE AND TYPE OF BIT: 8" AUGER
2. LOCATION (Coordinates or Station): 6958449.80 3308619.60	11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
3. DRILLING AGENCY: TULSA DISTRICT COE	12. MANUFACTURER'S DESIGNATION OF DRILL: FAILINC 1500
4. HOLE NO. (As shown on drawing title and file number): LHS-MW52	13. OVERBURDEN SAMPLES: DISTURBED 8, UNDISTURBED 0
5. NAME OF DRILLER: RAY VOILS	14. TOTAL NUMBER CORE BOXES: 0
	15. ELEVATION GROUND WATER: NOT DETERMINED
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.	16. DATE HOLE: STARTED 09/00/1994, COMPLETED 09/00/1994
7. THICKNESS OF OVERBURDEN: 22.0	17. ELEVATION TOP OF HOLE: 202.5
8. DEPTH DRILLED INTO ROCK: 0.0	18. TOTAL CORE RECOVERY FOR BORING: 0.0 %
9. TOTAL DEPTH OF HOLE: 22.0	R. PETERSON

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
200.5			LEAN CLAY (CL) (0.0 - 2.0) CL-ML, SANDY SILTY CLAY, BROWN, WET.		J-1	TYPE AUGER, ZONE 0.0- 22.0
198.5	3		LEAN CLAY (CL) (2.0 - 4.0) WITH SAND, REDDISH BROWN, MOIST.		J-2	SAMPLE / DEPTH: J-1 0.0- 2.0; J-2 2.0- 4.0; J-3 4.0- 7.5; J-4 7.5- 10.5; J-5 10.5- 13.0; J-6 13.0- 17.0; J-7 17.0- 20.5; J-8 20.5- 22.0
195.0	6		FAT CLAY (CH) (4.0 - 7.5) WITH SAND, REDDISH BROWN,MOIST		J-3	
192.0	9		LEAN CLAY (CL) (7.5 - 10.5) SANDY, REDDISH BROWN, MOIST.		J-4	
182.0	12, 15, 18		LEAN CLAY (CL) (10.5 - 20.5) WITH SAND, BROWN TO YELLOWISH BROWN, MOIST.		J-5, J-6, J-7	
180.5	21		FAT CLAY (CH) (20.5 - 22.0) YELLOWISH BROWN, MOIST.		J-8	
	24, 27, 30					

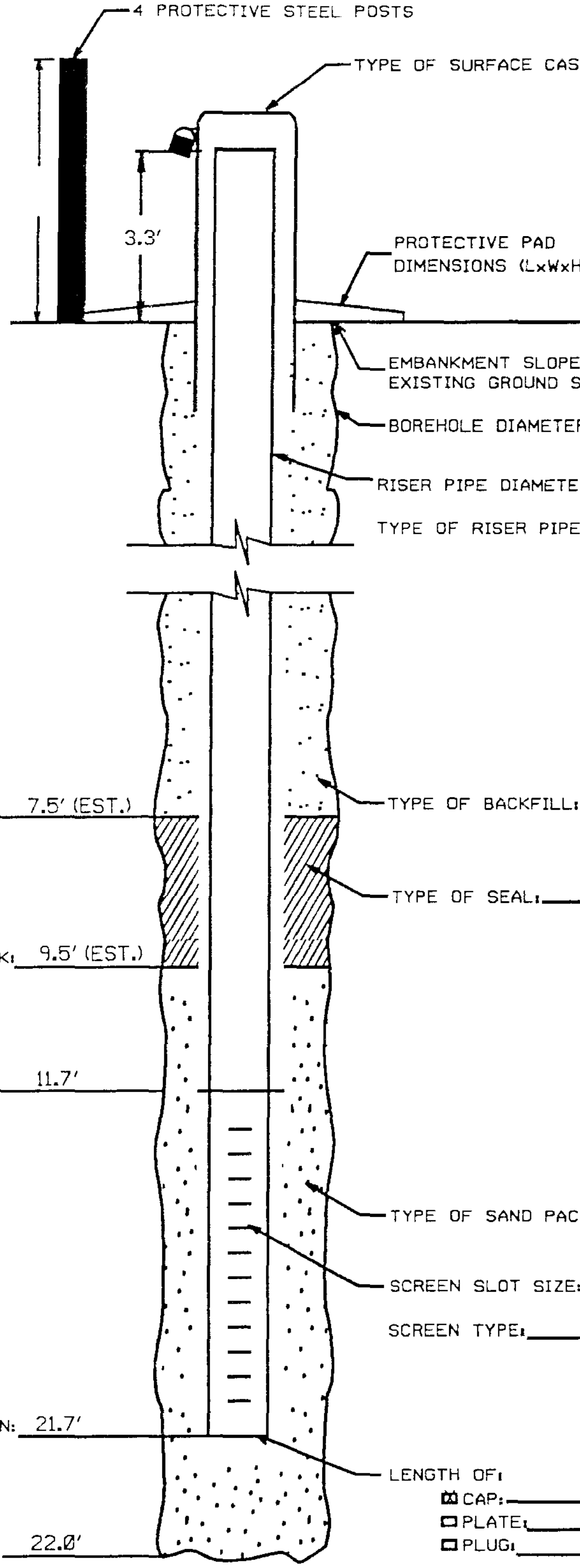
WELL NO. LHS-MW52

MONITORING WELL SHEET

PROJECT & INSTALLATION:
LONGHORN ARMY AMMUNITION PLANT - SUMPS

DATE STARTED: 9-1994

DATE COMPLETED: 9-1994



TYPE OF SURFACE CASING: STEEL

PROTECTIVE PAD DIMENSIONS (LxWxH): 4'X4'X6"

EMBANKMENT SLOPE OR EXISTING GROUND SURFACE.

GROUNDWATER DEPTH: NOT OBSERVED

GROUNDWATER DATE: ______

BOREHOLE DIAMETER: 8"

RISER PIPE DIAMETER: 4"

TYPE OF RISER PIPE: PVC

TOP OF SEAL: 7.5' (EST.)

TYPE OF BACKFILL: GROUT/5% BENTONITE

TYPE OF SEAL: BENTONITE

TOP OF SAND PACK: 9.5' (EST.)

TOP OF SCREEN: 11.7'

TYPE OF SAND PACK: 16/30

SCREEN SLOT SIZE: .010"

SCREEN TYPE: 316 SS

BOTTOM OF SCREEN: 21.7'

LENGTH OF:
☒ CAP: 6"
☐ PLATE: ______
☐ PLUG: ______

BOTTOM OF HOLE: 22.0'

INSPECTOR: RICHARD PETERSON

LHWCD.DGN LORI KRUSE

HOLE NO. LHS-MW53

DRILLING LOG	DIVISION SOUTHWEST	INSTALLATION LHAAP	SHEET 1 OF 1 SHEETS
1. PROJECT LHAAP-WASTE SUMPS		10. SIZE AND TYPE OF BIT 8" AUGER	
2. LOCATION (Coordinates or Station) 6958095.80 3309905.00		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY TULSA DISTRICT COE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number)	LHS-MW53	13. OVERBURDEN SAMPLES	DISTURBED 7 / UNDISTURBED 0
5. NAME OF DRILLER TOM BEAVERS		14. TOTAL NUMBER CORE BOXES	0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	NOT DETERMINED
		16. DATE HOLE	STARTED 09/20/1994 / COMPLETED 09/20/1994
7. THICKNESS OF OVERBURDEN 14.0		17. ELEVATION TOP OF HOLE	195.0
8. DEPTH DRILLED INTO ROCK 0.0		18. TOTAL CORE RECOVERY FOR BORING	0.0 %
9. TOTAL DEPTH OF HOLE 14.0		JO CAMRUD	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
192.0	0–3.0		SILT (ML) (0.0 – 3.0) SANDY, BROWN.			SAMPLE TYPE / ZONE: AUGER 0.0– 8.0; SPLITSPOON 8.0– 14.0. SAMPLE / DEPTH: J-1 3.0– 5.0; J-2 6.0– 6.5; J-3 8.0– 10.0; J-4 10.0– 12.0; J-5 12.0– 13.0; J-6 13.0– 13.5; J-7 13.5– 14.0
189.5	3.0–5.5		FAT CLAY (CH) (3.0 – 5.5) WITH SAND, BROWN, MOIST.		J-1	
187.8	5.5–7.2		LEAN CLAY (CL) (5.5 – 7.2) WITH SAND, GRAYISH BROWN, VERY MOIST.		J-2	
182.0	7.2–13.0		FAT CLAY (CH) (7.2 – 13.0) BROWN AND GRAY, MOIST TO VERY MOIST.		J-3, J-4, J-5	
181.5	13.0–13.5		SILT SAND (SM) (13.0 – 13.5) BROWN AND GRAY, WET.		J-6	
181.0	13.5–14.0		FAT CLAY (CH) (13.5 – 14.0) GRAY AND BROWN, MOIST.		J-7	

00954182

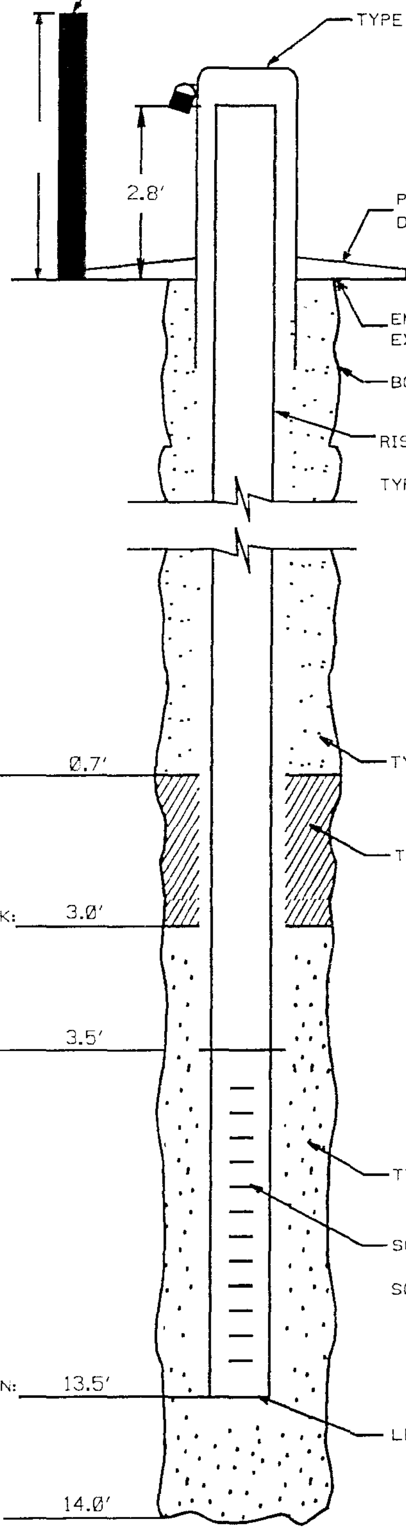
WELL NO. LHS-MW53

MONITORING WELL SHEET

PROJECT & INSTALLATION: LONGHORN ARMY AMMUNITION PLANT - SUMPS

DATE STARTED: 9-20-1994

DATE COMPLETED: 9-20-1994



4 PROTECTIVE STEEL POSTS

TYPE OF SURFACE CASING: STEEL

PROTECTIVE PAD DIMENSIONS (LxWxH): 4'X4'X6"

EMBANKMENT SLOPE OR EXISTING GROUND SURFACE.

GROUNDWATER DEPTH: NOT OBSERVED

GROUNDWATER DATE: ______

BOREHOLE DIAMETER: 8"

RISER PIPE DIAMETER: 4"

TYPE OF RISER PIPE: PVC

TOP OF SEAL: 0.7'

TYPE OF BACKFILL: GROUT/5% BENTONITE

TYPE OF SEAL: BENTONITE

TOP OF SAND PACK: 3.0'

TOP OF SCREEN: 3.5'

TYPE OF SAND PACK: 16/30

SCREEN SLOT SIZE: .010"

SCREEN TYPE: 316 SS

BOTTOM OF SCREEN: 13.5'

LENGTH OF:
- ☒ CAP: 6"
- ☐ PLATE: ______
- ☐ PLUG: ______

BOTTOM OF HOLE: 14.0'

INSPECTOR: MARYJO CAMRUD

LHWCD.DGN LORI KRUSE

00954183

HOLE NO. LHS-MW60

DRILLING LOG	DIVISION: SOUTHWEST	INSTALLATION: LHAAP	SHEET 1 OF 1 SHEETS

1. PROJECT: LHAAP-WASTE SUMPS	10. SIZE AND TYPE OF BIT: 8" AUGER
2. LOCATION (Coordinates or Station): 6957946.00 3309450.00	11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
3. DRILLING AGENCY: TULSA DISTRICT COE	12. MANUFACTURER'S DESIGNATION OF DRILL: FAILING 1500
4. HOLE NO. (As shown on drawing title and file number): LHS-MW60	13. OVERBURDEN SAMPLES: DISTURBED 12, UNDISTURBED 0
5. NAME OF DRILLER: RAY VOILS	14. TOTAL NUMBER CORE BOXES: 0
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER: NOT DETERMINED
	16. DATE HOLE: STARTED 09/00/1994, COMPLETED 09/00/1994
7. THICKNESS OF OVERBURDEN: 27.0	17. ELEVATION TOP OF HOLE: 195.6
8. DEPTH DRILLED INTO ROCK: 0.0	18. TOTAL CORE RECOVERY FOR BORING: 0.0 %
9. TOTAL DEPTH OF HOLE: 27.0	R. PETERSON

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
191.6	3		SILT (ML) (0.0 - 4.0) SANDY, DARK YELLOWISH BROWN, MOIST.		J-1, J-2	TYPE: AUGER; ZONE: 0.0- 27.0
188.1	6		SILT SAND (SM) (4.0 - 7.5) YELLOWISH BROWN, MOIST.		J-3	
187.3			LEAN CLAY (CL) (7.5 - 8.3) SANDY, MOIST, LIGHT GRAY AND YELLOWISH BROWN WITH BROWN.		J-4	
184.1	9		LEAN CLAY (CL) (8.3 - 11.5) WITH SAND, LIGHT GRAY AND BROWNISH YELLOW, MOIST, IRON-OXIDE STAINS.		J-5	
183.3	12		CLAY SAND (SC) (11.5 - 12.3) DARK YELLOWISH BROWN AND YELLOWISH BROWN AND LIGHT GRAY MOIST, ANGULAR ROCK.		J-6	
179.6	15		LEAN CLAY (CL) (12.3 - 16.0) WITH SAND, LIGHT GRAY AND YELLOWISH BROWN, MOIST.		J-7	
176.1	18		FAT CLAY (CH) (16.0 - 19.5) LIGHT GRAY AND DARK YELLOWISH BROWN, MOIST.		J-8	
175.4			CLAY SAND (SC) (19.5 - 20.2) LIGHT GRAY AND YELLOWISH BROWN, WET, SMALL AMOUNT OF BLACK STRINGERS.		J-9	
173.3	21		CLAY SAND (SC) (20.2 - 22.3) SC-SM, SILTY CLAYEY SAND, YELLOWISH BROWN, WET.		J-10	
170.2	24		CLAY SAND (SC) (22.3 - 25.4) LIGHT GRAY AND YELLOWISH BROWN, WET, SILTY.		J-11	
168.6	27		FAT CLAY (CH) (25.4 - 27.0) WITH SAND, YELLOWISH RED AND LIGHT GRAY, DAMP.		J-12	
	30					

Remarks:

SAMPLE	DEPTH
J-1	0.0- 2.0
J-2	2.0- 4.0
J-3	4.0- 7.5
J-4	7.5- 8.3
J-5	8.3- 11.5
J-6	11.5- 12.3
J-7	12.3- 16.0
J-8	16.0- 19.5
J-9	19.5- 20.2
J-10	20.2- 22.3
J-11	22.3- 25.4
J-12	25.4- 27.0

00954184

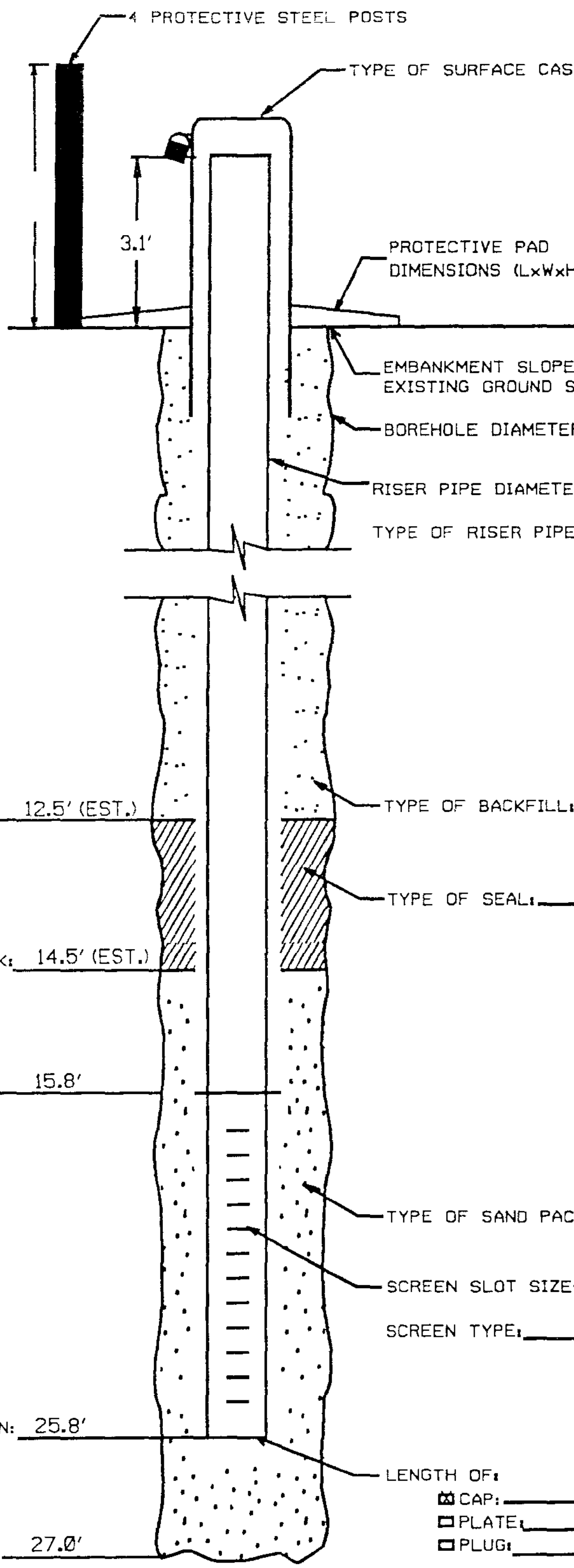
WELL NO. LHS-MW6Ø

MONITORING WELL SHEET

PROJECT & INSTALLATION:
LONGHORN ARMY AMMUNITION PLANT - SUMPS

DATE STARTED:
9-1994

DATE COMPLETED:
9-1994



TYPE OF SURFACE CASING: STEEL

PROTECTIVE PAD DIMENSIONS (LxWxH): 4'X4'X6"

EMBANKMENT SLOPE OR EXISTING GROUND SURFACE.

GROUNDWATER DEPTH: NOT OBSERVED

GROUNDWATER DATE:

BOREHOLE DIAMETER: 8"

RISER PIPE DIAMETER: 4"

TYPE OF RISER PIPE: PVC

TOP OF SEAL: 12.5' (EST.)

TYPE OF BACKFILL: GROUT/5% BENTONITE

TYPE OF SEAL: BENTONITE

TOP OF SAND PACK: 14.5' (EST.)

TOP OF SCREEN: 15.8'

TYPE OF SAND PACK: 16/3Ø

SCREEN SLOT SIZE: .Ø1Ø"

SCREEN TYPE: 316 SS

BOTTOM OF SCREEN: 25.8'

LENGTH OF:
☒ CAP: 6"
☐ PLATE:
☐ PLUG:

BOTTOM OF HOLE: 27.Ø'

INSPECTOR:
RICHARD PETERSON

LHWCO.DGN LORI KRUSE

00954185

Hole No. 50WW01(S)

DRILLING LOG	DIVISION USACE - Tulsa	INSTALLATION LHAAP - Karnack, TX	SHEET 1 OF 2 SHEETS

1. PROJECT LHAAP Group IV Phase III	10. SIZE AND TYPE OF BIT Auger Bits
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY GPI, Austin, TX	12. MANUFACTURER'S DESIGNATION OF DRILL CME-75 / 3¼" I.D. 7⅝" O.D. / 5' CME Cont. Sampler / 1" O.D. HSA
4. HOLE NO. (As shown on drawing title and file number) 50WW01	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED: 5 — UNDISTURBED: —
5. NAME OF DRILLER José Londeros	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER —
	16. DATE HOLE — STARTED 7-27-98 — COMPLETED 7-27-98
7. THICKNESS OF OVERBURDEN Penetrated 20.0 ft.	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK N/A	18. TOTAL CORE RECOVERY FOR BORING N/A %
9. TOTAL DEPTH OF HOLE 20.0 ft. below grade	19. SIGNATURE OF INSPECTOR [signature] CPG

ELEVATION a	DEPTH (ft.) b	USC LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–0.2	OL	- 0.2' of Topsoil sandy silt with abundant roots - Dry overlying -			Commenced HSA @ 0835
	0.2–4	SM	- Sandy silt - Lt. brown, gray, tan, and yellowish brown, fine grained sand, trace to some roots - Dry (loose)	3.2'	SS #1 0.0 to 4.0'	HNu Reading in sampler = 0 ppm; HNu Reading @ Augers = 0 ppm
	4–7.7		- Sandy silt - Lt. gray, Lt. brown, and tan, fine grained sand, poorly graded - Dry (stiff to loose)	4.6'	SS #2 4.0' to 9.0'	HNu Reading in Sampler = 0 ppm
	7.7–11.6	CL	- Silty clay Lt. gray and greenish-gray, some tan with abundant reddish-brown and yellowish orange staining and mottling, horiz. and irregular layering (v. thin) trace fine sand throughout - Damp (v. stiff)			HNu Reading @ Augers = 0 ppm
	11.6–13.5	SC / CL / SC	- Sandy Clay Lt. gray and Light brown, fine grained sand, some sl. plastic, silty poorly sorted sand - Wet to saturated @ 12.4'	5.0'	SS #3 9.0' to 14.0'	HNu Reading in Sampler = 0 ppm; HNu Reading @ Augers = 0 ppm
	13.5–16.2	CL	- Silty clay - Lt. gray and greenish-gray - some tan, with abundant yellowish-brown mottling and staining, plastic, some fine sand - Damp (stiff)			HNu Reading in Sampler = 0 ppm
	16.2–18	SC / CL / SC	- Clayey sand - Lt. brown and gray - some tan (mottled) fine grained sand, some v. silty, poorly sorted, some sl. plastic - saturated (loose)	5.0'	SS #4 14.0' to 19.0'	HNu Reading @ Augers = 0 ppm
	18–20	CL	- Silty clay - Lt. to med. gray, brown, tan, orange-brown and rust colored mottled, streaked, stained and layered (v. thin) trace to some fine sand, v. plastic - Damp (v. stiff)	1.0'	SS #5 19.0'-20.0'	HNu Reading in Sampler = 0 ppm; HNu Reading @ Augers = 0 ppm

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LHAAP Group IV — HOLE NO. 50WW01

00954186

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | **Hole No.** 50WW01(S)

PROJECT | INSTALLATION LHAAP - Karnack, TX | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			T.D. @ 20.0 ft. below grade in Damp silty clay @ 0910			T.D. @ 20' below grade 0940 overdrilled pilot hole with plugged (Enviroplug) 11" O.D. Auger to 20.0 ft. for 4" Dia SS Mon. well install. Bent./cement Grout 5'-to grade Bent. seal 8'-5' Sugar Sand (30-70) 9'-8' Primary filterpack (16-30) 20'-9' 4" SS #10 slot Screen 20'-10' T.D. - 20.0' below grade

ENG FORM 1836-A JUN 67 (ER 1110-1-1801) GPO 1980 OF - 628-603 | PROJECT LHAAP Group IV | HOLE NO. 50WW01

00954187

Hole No. 50WW02(S)

DRILLING LOG	DIVISION: USACE - Tulsa	INSTALLATION: LHAAP - Karnack, TX	SHEET 1 OF 1 SHEETS

1. PROJECT: LHAAP Group II Phase III
2. LOCATION (Coordinates or Station):
3. DRILLING AGENCY: GPI Inc - Austin, TX
4. HOLE NO. (As shown on drawing title and file number): 50WW02
5. NAME OF DRILLER: José Landeros
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: Penetrated 17 ft.
8. DEPTH DRILLED INTO ROCK: N/A
9. TOTAL DEPTH OF HOLE: 19.0' ft. below grade
10. SIZE AND TYPE OF BIT: Auger bits
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-75 / 5' CME Cont. Sampler / 3¼" I.D. 7" O.D. HSA / 11" O.D. HSA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: — UNDISTURBED: —
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED 7-25-98 COMPLETED 7-26-98
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: N/A %
19. SIGNATURE OF INSPECTOR: [signature] CKm CAG

ELEVATION a	DEPTH (ft.) b	USCS LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–3	Fill	Fill - Dark brown and Reddish brown silty clay, silty sand, and sandy silt with abundant fine to coarse gravel, trace Asphalt Frag. - Dry	2.5'	SS #1 0.0' to 4.0'	Commenced HSA 7" O.D. pilot hole @ 1330; HNu Reading @ sampler = 0 ppm
	3–5	CL	Silty clay - Dark brown and reddish-brown some orange-brown silt laminations - Dry to Damp (stiff)			HNu Reading @ Augers = 0 ppm
	5–9		Clayey silt - Lt. to med. gray with some orange-brown and reddish-brown mottling, streaking, and staining, abundant v. thin silty sand and fine sandy silt irregular layers. sl. plastic - Dry to Damp (med. stiff) (inc. silt and sand content with depth)	4.0'	SS #2 4.0' to 9.0'	HNu Reading @ sampler = 0 ppm; (Clay "molds" easily in hand [moisture] below 8 ft.)
	9–14		Clay silt / silty clay - Lt. greenish-gray, tan, and gray with some reddish brown streaking and staining, trace to some fine sand throughout, plastic - Damp to sl. moist (stiff)	No Rec. (logged cuttings)	SS #3 9.0' to 14.0'	HNu Reading @ sampler = NA; HNu Reading @ augers = 0 ppm
	14–19		Silty clay - Lt. gray and sl. greenish gray with some to abundant reddish and orange-brown streaking, staining and mottling, some fine sand throughout and occ. in v. thin layers, trace roots - Damp to Moist - occ. wet along fine sands (stiff)	5.0'	SS #4 14.0' to 19.0'	HNu Reading @ sampler = 0 ppm
	19–20		T.D. @ 19.0' below grade in silty clay @ 1430			Water @ base of hole (1 ft.) after 15 min.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT: LHAAP Group V HOLE NO. 50WW02

00954188

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE	Hole No. SOWW02
PROJECT LHAAP Group V Phase III	INSTALLATION LHAAP - Karnack, TX	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Overdrilled pilot hole with 11" O.D. plugged HSA - Installed 4" SS mon. well Grout - 4.5' to surface Bent. seal 7.5'-4.5' Sugar Sand (30 no) 8.5'-7.5' Primary Sand (16-30) 19'-8.5' 4" SS #10 slot screen 19'-9' T.D. hole 19' below grade

00954189

Hole No. SOWW03(S)

DRILLING LOG	DIVISION USACE - Tulsa	INSTALLATION LHAAP-Karnack, TX	SHEET 1 OF 2 SHEETS

1. PROJECT: LHAAP Group V Site 50	10. SIZE AND TYPE OF BIT: Auger Bits
2. LOCATION (Coordinates or Station): LHAAP Group V Phase III Site 50	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY: GPI, Inc. Austin, TX	12. MANUFACTURER'S DESIGNATION OF DRILL: CME-75 / 5' 2" cont. Sampler / 3¼" I.D. 7" O.D. HSA / 11" OD HSAs
4. HOLE NO. (As shown on drawing title and file number): SOWW03	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED —
5. NAME OF DRILLER: José Lunteros	14. TOTAL NUMBER CORE BOXES: N/A
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER: —
	16. DATE HOLE: STARTED 7-26-98; COMPLETED 7-26-98
7. THICKNESS OF OVERBURDEN: Penetrated 20.0 ft	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: N/A %
9. TOTAL DEPTH OF HOLE: 20.0 below grade	19. SIGNATURE OF INSPECTOR: [signature] CiFa CPG

ELEVATION (a)	DEPTH (Ft) (b)	USC LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	0–3	SM	- Sandy silt - Lt. gray, lt. brown and tan, fine grained sand, poorly graded, trace roots - Dry to Damp (med. stiff to soft)	4.0'	SS #1 0.0' to 4.0'	Commenced HSA = 3¼" I.D. HSAs @; HNu Reading @ Sampler = (10.2 eV PID) 0 ppm
	3–6	CL	- Silty clay - Lt. to med. gray, abundant reddish-brown and yellow-brown mottling and staining, some fine sand, trace roots - Some Damp to Generally Moist plastic (stiff)			HNu Reading @ Augers = 0 ppm
	6–8		- Silty clay - Lt. to med. gray-brown, tan, orange-brown and yellow-brown mottled, streaked and stained, Tr. fine sand and roots - Damp	4.5'	SS #2 4.0' to 9.0'	HNu Reading @ Sampler = 0 ppm
	8–9	SC	Sandy clay - Lt. gray tan and orange-brown (mottled), fine grained sand, Sl. plastic - Moist			HNu Reading @ augers = 0 ppm
	9–14	CL	- Silty clay - Lt. gray and greenish gray with abundant yellowish-orange and reddish-brown staining, some black colored root-like structures, some fine sand - Damp to prev. Moist (V. stiff) *(Some vis H_2O along horiz. breaks with thin silts and sands)	5.0'	SS #3 9.0' to 14.0'	HNu Reading @ Sampler = 0 ppm; HNu Reading @ Augers = 0 ppm
	14–17		- Silty clay - Lt. gray and greenish-gray with abundant yellowish-orange mottling and staining, some black root-like structures throughout sample, trace to some fine sand - Moist to wet along with thin silt/sand breaks (stiff)	5.0'	SS #4 14.0' to 19.0'	(* Trace "solvent" like odor from sample #4); HNu Reading @ Sampler = 0 ppm
	17–20		- Silty clay - Lt. gray and greenish gray with yellowish-orange staining and some (5 to 15%) black root like structures - Moist (Vis. H_2O in sample along horiz. breaks @ 17' and 18' of sample #4) @ 20.0' @ 0 ppm; T.D. in Silty clay (as above)	1.0'	SS #5 19.0' to 20.0'	HNu Reading @ Augers = 20 ppm; HNu Reading @ Sampler = 0 ppm; HNu Reading @ Augers = 10 ppm

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT | HOLE NO. SOWW03

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE	Hole No. 50WW03
PROJECT Group V Phase II Site 50	INSTALLATION LHAAP-Karnack, TX	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						- Pulled Augers up 10ft and waiting on water in open hole @ 0950 - 1010 wl @ 18.2' in open hole • overdrilled 7" pilot hole with plugged 11" O.D. HSA to 20' for 4" SS Mon Well installation - Bent/cement Grout 5' to grade - Bent. seal 8'-5' - Sugarsand (30-70) 9'-8' - Primary Sand (16-30) 20'-9' - 4" SS #10 slot screen 20'-10' - T.D. -20.0' below grade with 11" OD Augers

Hole No. 50UW04

00954191

DRILLING LOG	DIVISION USACE - Tulsa	INSTALLATION LHAAP - Karnack, TX	SHEET 1 OF 2 SHEETS

1. PROJECT: LHAAP Group IV Phase III	10. SIZE AND TYPE OF BIT: Auger Bits
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
DRILLING AGENCY: GPI - Austin TX	12. MANUFACTURER'S DESIGNATION OF DRILL: CME-75 / 3¼" I.D. 7" O.D. HSA / Cont. Sampler / 7" OD HSA
4. HOLE NO. (As shown on drawing title and file number): 50WW04	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED —
5. NAME OF DRILLER: José Londeros	14. TOTAL NUMBER CORE BOXES: N/A
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 7-26-98; COMPLETED 7-27-98
7. THICKNESS OF OVERBURDEN: Penetrated 20 ft.	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK: N/A	18. TOTAL CORE RECOVERY FOR BORING: N/A %
9. TOTAL DEPTH OF HOLE: 20.0 ft. Below Grade	19. SIGNATURE OF INSPECTOR: [signature] for Cika Sue

ELEVATION a	DEPTH (ft) b	USC LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–4	SM	- Sandy silt - Lt. gray, Lt. brown, and tan, fine grained sand, poorly sorted, trace to some roots - Dry (stiff) (Clay content inc.)	4.0'	SS #1 0.0' to 4.0'	Commenced 7" O.D. HSA @1415. HNu Reading in sampler = 0ppm. HNu Reading @ Augers = 0ppm
	4–9	CL	- Silty clay - Med. Reddish brown with Lt. to med. gray mottling, some small black specks throughout, trace to some fine sand, trace roots, plastic - Moist (stiff)	5.0'	SS #2 4.0' to 9.0'	HNu Reading in sampler = 0ppm. HNu Reading @ Augers = 0ppm
	9–11.5	SC	- Sandy clay - Lt. gray to med. gray, tan, orange-brown, and yellowish-orange (mottled) fine grained sand, sl plastic throughout in more clayey zones - Moist to Sl. wet (soft-loose)	5.0'	SS #3 9.0' to 14.0'	HNu Reading in sampler = 0ppm. HNu Reading @ Augers = 0ppm
	11.5–16	CL	- Silty clay - Lt. gray, greenish-gray, tan and Dark gray, mottled, streaked and layered (v. thin), some v. thin sl. wet sandy silt lenses (horiz.), some fine sand throughout - Moist to sl. wet			
	16–19		Clayey silt - Lt. to med. gray and greenish-gray, tan and yellowish-orange, some to abundant fine sand throughout sample, sl. plastic - Moist to sl. wet (soft to stiff)	5.0'	SS #4 14.0' to 19.0'	HNu Reading in sampler = 0ppm. HNu Reading @ Augers = 0ppm
	19–20		T.O. @ 20.0' Below grade in silty clay @1500	1.0'	SS #5 19.0 to 20.0	HNu Reading @ Augers = 0ppm

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Site 50 | HOLE NO. 50WW04

00954192

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE	Hole No. 50WW04
PROJECT	INSTALLATION	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						-1' of water @ base of borehole upon completion (T.D. @ 20.0')
						-Pilot hole was overdrilled with plugged 11" HSA to 20.0' below grade. For 4" SS mon. well install.
						Bent/cement Grout 5'-grade
						Bent. seal 8'-5'
						Sugar Sand (30-70) 9'-8'
						Primary Filterpack (16-30) 20-9'
						4" SS #10 slot screen 20'-10'
						T.D. @ 20.0' below grade

ENG FORM 1836-A JUN 67 (ER 1110-1-1801) GPO 1980 OF-628-603 PROJECT HOLE NO. 50WW04

TRACKING# 12923

STATE OF TEXAS WELL REPORT

OWNER: Longhorn Army Ammunition Plant ADDRESS: Hwy 134 @ Spur 449 Karnack ,TX 75661

ADDRESS OF WELL'S LOCATION:
wy 23 Spur Karnack ,TX 75661

COUNTY: Harrison LATITUDE: 324042 LONGITUDE: 940822 Brand/Model of GPS: Garmin III Plus

Owner's Well Number: 50WW05 ELEVATION: Grid Number: 35 - 23 - 6

TYPE OF WORK:
- [x] New Well
- [ ] Replacement Well
- [ ] Deepening
- [ ] Reconditioning
- [ ] Plugging
- [ ] Rig Supply

PROPOSED USE:
- [x] Monitor Well
- [ ] Env. Soil Boring
- [ ] Domestic
- [ ] Test Well
- [ ] Industrial
- [ ] Irrigation
- [ ] Injection
- [ ] Public Supply
- [ ] De-watering

If Public Supply well, were plans submitted to the TNRCC? [ ] Yes [ ] No

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WELL LOG:
Date Drilling:
Started 9/18/2002
Completed 9/18/2002

DIAMETER OF HOLE:

Dia. (in.)	From (ft.)	To (ft.)
10.25	Surface	23

DRILLING METHOD:
- [ ] Driven
- [ ] Air Hammer
- [x] Hollow Stem Auger
- [ ] Bored
- [ ] Air Rotary
- [ ] Cable Tool
- [ ] Reverse Circulation
- [ ] Mud Rotary
- [ ] Jetted
- [ ] Other

BOREHOLE COMPLETION:
- [ ] Open Hole
- [ ] Underreamed
- [ ] Other
- [ ] Straight Wall
- [x] Gravel Packed

Gravel Packed Interval from 10 ft. to 23 ft.

CEMENTING DATA:
Cemented from 0 ft. to 7 ft. No. of sacks used 2
Cemented from ft. to ft. No. of sacks used
Method Used Gravity
Cemented By Driller
Distance to Septic System ft.
Method of Verification

SURFACE COMPLETION:
- [ ] Specified Surface Slab Installed
- [ ] Pitless Adapter Used
- [x] Specified Steel Sleeve Installed
- [ ] Approved Alternative Procedure Used

WATER LEVEL:
Static level ft. below land surface Date
Artesian Flow gpm. Date

PLUGGING INFO:
- [ ] Well Plugged within 48 hours

Casing left in well: Cement/Bentonite left in well:

From (ft.)	To (ft.)	From (ft.)	To (ft.)	Cem/Bent	Sacks Used:

TYPE OF PUMP:
- [ ] Turbine
- [ ] Jet
- [ ] Submersible
- [ ] Cylinder
- [ ] Other

Depth to pump bowls, cylinder, jet, etc.

PACKERS:

Type	Depth

WELL TESTS:
Type of test: [ ] Pump [ ] Bailer [ ] Jetted [ ] Estimated
Yield: gpm with ft. drawdown after hrs.

WATER QUALITY:
Did Driller knowingly penetrate any strata which contained undesirable constituents? [ ] Yes [x] No

Type of water:
Depth of Strata:
Chemical Analysis made? [ ] Yes [ ] No

COMPANY NAME ETTL Engineers & Consultants Inc. WELL DRILLER'S LICENSE NO. 2126
ADDRESS 1717 E. Erwin Tyler TX 75702
Name as Signature Doug Hinds Registered Driller Apprentice
Dr Comments:

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

Section 32.005 of the Texas Water Code, concerning confidential information in the Reporting of Well Logs, reads as follows:

"Each copy of a well log, other than a department copy must include the name, mailing address, and telephone number of the department. The well log shall be recorded at the time of drilling, and must show the depth, thickness, and character of the strata penetrated, the location of water-bearing strata, the depth, size and character of casing installed, and any other information required by department rule. 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 or person for whom the well was drilled."

The last sentence specifies the means whereby you may, if you wish, assure that logs of your wells will be kept confidential. Please include the report's Tracking number on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
512-463-7880

DESCRIPTION AND COLOR OF FORMATION MATERIAL

From (ft.) To (ft.)	Description
0-4	Silty sand - light brown
4-10	Silty - light gray
10-11	Clay - light gray
11-12	Sand - dark gray
12-12.5	Clay - dark gray
12.5-13.25	Sand - dark brown
13.25-14	Clay - dark gray
14-20	Silty sand - dark brown
20-20.5	Clay - dark gray
20.5-23	Sand - brown & orange

CASING, BLANK PIPE, AND WELL SCREEN DATA

Dia.	New/ Used	Type	Setting From/To	Gage
4	New	304 Stainless Steel	0 - 12	
4	New	304 Stainless Steel - wirewrap	12 - 22	0.010"

Hole No. 50WW05

00954195

DRILLING LOG	DIVISION TULSA	INSTALLATION LONGHORN AAP	SHEET 1 OF 2 SHEETS

1. PROJECT LHAAP PLANTWIDE PERCHLORATE	10. SIZE AND TYPE OF BIT 12" OD HSA
2. LOCATION (Coordinates or Station) NORTH 6957581.566 EAST 3309709.464	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) 195.2 MSL
3. DRILLING AGENCY STEP, INC.	12. MANUFACTURERS DESIGNATION OF DRILL MOBILE B-61
4. HOLE NO. (As shown on drawing title and title number) 50WW05	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED: — UNDISTURBED: 4
5. NAME OF DRILLER (DOUG) ETTL, INC.	14. TOTAL NUMBER CORE BOXES —
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE STARTED 9/18/02 COMPLETED 9/18/02
	17. ELEVATION TOP OF HOLE
7. THICKNESS OF OVERBURDEN —	18. TOTAL CORE RECOVERY FOR BORING —
8. DEPTH DRILLED INTO ROCK NA	19. SIGNATURE OF INSPECTOR [signature]
9. TOTAL DEPTH OF HOLE 23 ft	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
191.2	0–4 (1, 2, 3, 4)		SAND - 7.5YR 6/4, VERY SILTY, MOIST LIGHT BROWN			
185.2	4–10 (5, 6, 7, 8, 9, 10)		SILT - 7.5YR 7/1 LIGHT GRAY, ABUNDANT CLAY DRY BECOMES MOIST AT 8FT ABUNDANT ORANGE IRON STAIN			
183.95	10–11 (11)		CLAY - 7.5YR 7/1 VERY SILTY LIGHT GRAY ABUNDANT IRON STAIN MOIST			
183.2	11–12 (12)		SAND - 7.5YR 3/4, DARK BROWN, VERY SILTY, MOIST			
	12–12.7		CLAY - VERY SILTY DARK GRAY MOIST			
	13		SAND - DARK BROWN, VERY SILTY, MOIST			
	13.5–14		CLAY - DARK GRAY, VERY SILTY, MOIST			
	14–17 (15, 16)		SAND - 7.5YR 3/4 SILTY, VERY MOIST BECOMES WET AT 14 FT			

ENG FORM 1836 MAR 71	PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)	PROJECT LHAAP PLANTWIDE PERCHLORATE	HOLE NO. 50WW05

00954196

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE	Hole No. 50WW05
PROJECT LHAAP PLANT WIDE PERCHLORATE	INSTALLATION LONGHORN AAP	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
175.2	18 19 20		SAND - 7.5YR 3/4 DARK BROWN ABUNDANT ORANGE IRON STAIN BECOMES VERY WET AT 18.2 FT			
			CLAY - 7.5YR 4/1 DARK GRAY			
172.2	21 22 23		SAND - 7.5YR 5/6 BROWN TO ORANGE VERY SILTY ~~ABUNDANT~~ IRON STAINED BANDS VERY MOIST			
						TOTAL DEPTH = 23 ft

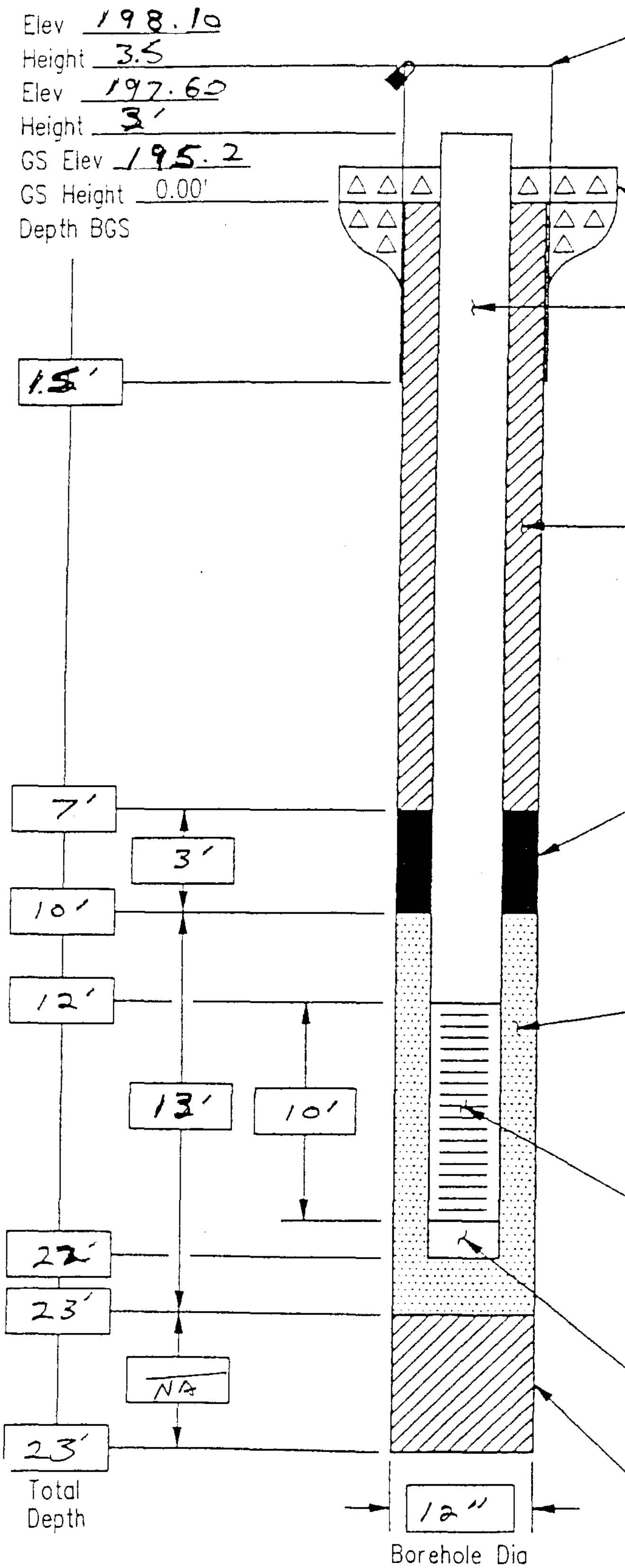
18 19 20 21 22 23

ENG FORM 1836-A (ER 1110-1-1801)
JUN 67
GPO 1991-618-759/40491

PROJECT LHAAP PLANT WIDE PERCHLORATE
HOLE NO. 50WW05

MONITORING WELL CONSTRUCTION LOG - Standard

WELL NO.: 50WW05	INSTALLATION: LONGHORN AAP	SITE: LHAAP SITE 50
PROJECT NO.: 114-109 / 114-001	CLIENT/PROJECT: TULSA COE, LHAAP PERCHLORATE	
CONTRACTOR: STEP, INC	DRILLING CONTRACTOR: ETTL, INC	
START - DATE: 9/18/02 TIME: 09:00	END - DATE: 9/18/02 TIME: 13:00	
BUILT BY:	WELL COORDINATES: N 6957581.566 E 3309709.464	



PROTECTIVE CSG
Material / Type HINGED LOCKING CAP STEEL
Diameter 8" SQUARE
Weep Hole ☐ Yes ☒ No
GUARD POSTS ☒ Yes ☐ No
No. 4 Type STEEL / CONCRETE FILLED

SURFACE PAD
Composition & Size CONCRETE 3' x 3' x 6"

RISER PIPE
Type 304 STAINLESS STEEL
Diameter 4"
Total Length (TOC to TOS) 15'
Ventilated Cap ☒ Yes ☐ No
O-Rings For Threads ☐ Yes ☒ No

GROUT
Composition & Amount TYPE I CEMENT WITH POWDERED BENTONITE
Tremied ☒ Yes ☐ No
Interval BGS 0 - 7'

CENTRALIZERS ☐ Yes ☒ No
Depth(s)

SEAL
Type PELLET BENTONITE (3/8") [2 BUCKETS]
Source BAROID
Setup/Hydration Time 2 HR
Volume Fluid Added 10 GALLON
Tremied ☐ Yes ☒ No

FILTER PACK
Type ANSI/NSR61 - 1994 (20-40)
Amount Used 14 BAGS
Tremied ☐ Yes ☒ No
Source
Gr Size Dist

SCREEN
Type 304 STAINLESS STEEL
Diameter 4" WIRE WRAPPED
Slot Size 0.01
Interval BGS 12' TO 22'

SUMP
Interval BGS NA
Type of Bottom Cap

BACKFILL PLUG
Material NA
Setup/Hydration Time
Tremied ☐ Yes ☐ No

Shaw

Drilling Log

Monitoring Well **50WW06**

Project *Longhorn Army Ammunition Plant* Owner *Shaw E&I, Inc.*
Location *Karnack, Texas* Proj. No. *845714*
Surface Elev. *193.0 ft.* Total Hole Depth *58.0 ft.* North *6957553.93 ft* East *3309790.221 ft.*
Top of Casing *195.35 ft.* Water Level Initial ▽ *13.0 ft.* Static ▼ *11.9 ft.* Diameter *10 in.*
Screen: Dia *4 in.* Length *10 ft.* Type/Size *PVC/0.01 in.*
Casing: Dia *4 in.* Length *50.35 ft.* Type *Sch. 40 PVC*
Fill Material *20/40 Sand, Bentonite Grout* Rig/Core *Foremost 5500/5' Core Barrel*
Drill Co. *ETTL* Method *Hollow Stem Auger w/Mud Rotary Capabilities*
Driller *Doug Hines* Log By *Dale Jayne* Date *8/3/04* Driller # *NA*
Checked By *Kay Everett* License No. *NA*

COMMENTS
APPROXIMATE DIAMETER OF BOREHOLE IS IS 9 7/8"

Depth (ft.)	Well Completion	PID (ppm)	Sample ID / % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.	Elevation (ft.)
						4'x4'x6" Conc. Pad w/ 4" diameter bollards	
0						SILTY CLAY, PALE BROWN, SOFT, MOIST	192.99
		0.0	NA / 100%				192
2							
					CL	-LIGHT BLUISH-GRAY MOTTLING THROUGHOUT THE CORE	190
4							
		0.0	NA / 80%				188
6							
						SAND, FINE-GRAINED, SOFT, LOOSE, MOIST	186
8						-BECOMES WET, PALE BROWN, LIGHT GREENISH-GRAY THROUGHOUT CORE	
							184
10		0.0	NA / 80%				
						-BECOMES YELLOW IN COLOR	182
12 ▼							
▽							180
14							
		0.0	NA / 100%			-SOME CLAY NOTICED	178
16							
						-BECOMES PALE BROWN	176
18					SP		
							174
20		0.0	NA / 80%				
							172
22							
							170
24							
		0.0	NA / 60%				168
26							
							166
28							
		0.0	NA / 80%				164
30							

Continued Next Page

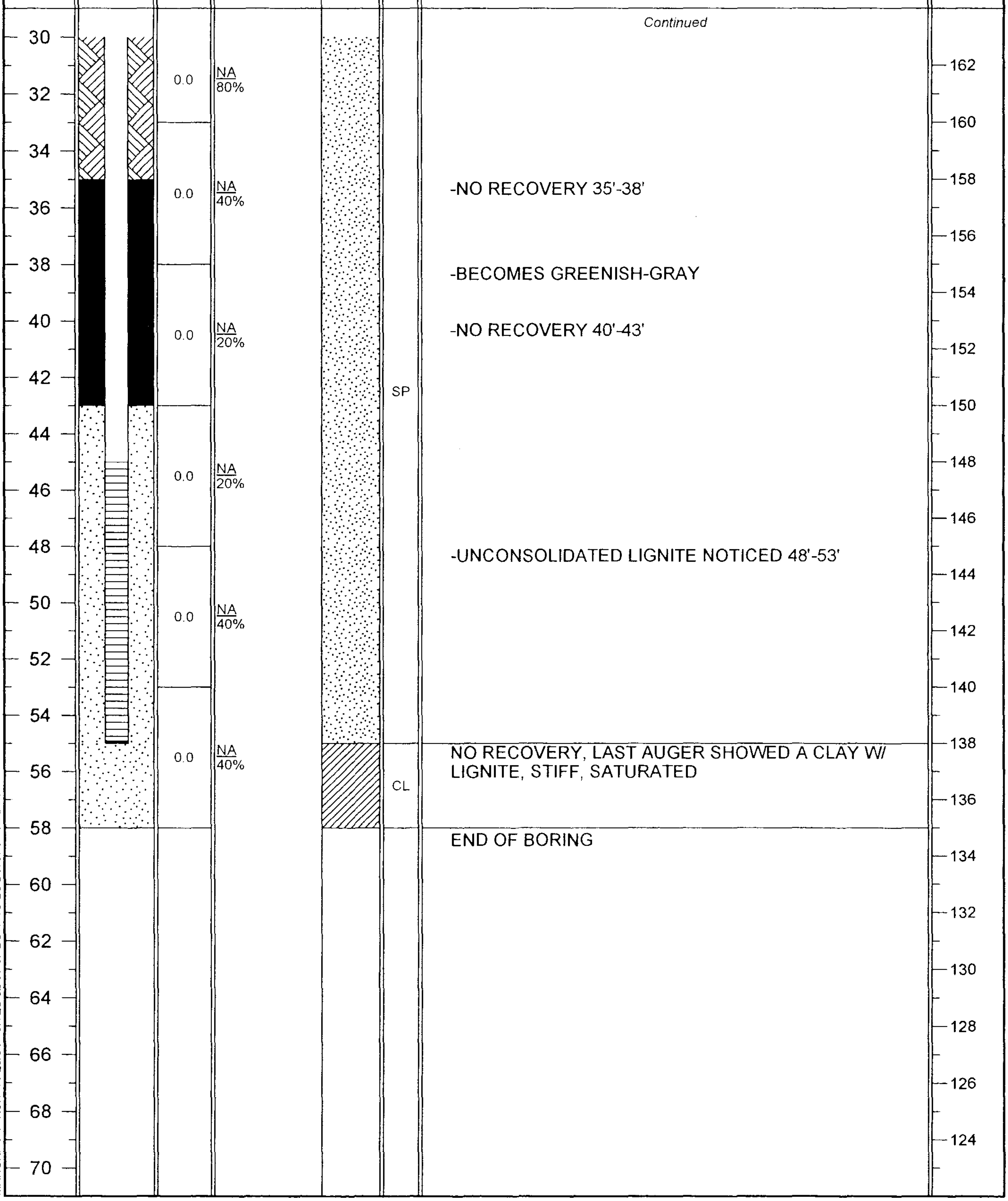
Drilling Log

Monitoring Well **50WW06**

Project: *Longhorn Army Ammunition Plant* Owner: *Shaw E&I, Inc.*

Location: *Karnack, Texas* Proj. No. *845714*

Depth (ft.)	PID (ppm)	Sample ID / % Recovery	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.	Elevation (ft.)
				Continued	
30–34	0.0	NA / 80%	SP		
34–38	0.0	NA / 40%	SP	-NO RECOVERY 35'-38'	
38–42	0.0	NA / 20%	SP	-BECOMES GREENISH-GRAY -NO RECOVERY 40'-43'	
42–46	0.0	NA / 20%	SP		
46–50	0.0	NA / 40%	SP	-UNCONSOLIDATED LIGNITE NOTICED 48'-53'	
50–55	0.0	NA / 40%	SP		
55–58	0.0	NA / 40%	CL	NO RECOVERY, LAST AUGER SHOWED A CLAY W/ LIGNITE, STIFF, SATURATED	138
58				END OF BORING	



STATE OF TEXAS WELL REPORT for Tracking #46655

Owner:	**Longhorn Army Ammunition Plant**	Owner Well #:	**50WW06**
Address:	**Hwy 143 @ Spur 449, LHAAP** **Karnack , TX 75661**	Grid #:	**35-24-4**
Well Location:	**Hwy 143 @ Spur 449 LHAAP** **Karnack , TX 75661**	Latitude:	**32° 40' 12" N**
Well County:	**Harrison**	Longitude:	**094° 06' 52" W**
Elevation:	**No Data**	GPS Brand Used:	**Garmin 12 GPS**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:	Started: **8/3/2004** Completed: **8/3/2004**
Diameter of Hole:	Diameter: **9 7/8 in From Surface To 58 ft**
Drilling Method:	**Mud Rotary Hollow Stem Auger**
Borehole Completion:	Gravel Packed From: **43 ft to 58 ft** Gravel Pack Size: **20/40**
Annular Seal Data:	1st Interval: **From 35 ft to 43 ft with 2 bentonite (#sacks and material)** 2nd Interval: **From 0 ft to 35 ft with 8 cement (#sacks and material)** 3rd Interval: **No Data** Method Used: **Tremie pipe** Cemented By: **Driller** Distance to Septic Field or other Concentrated Contamination: **No Data** Distance to Property Line: **No Data** Method of Verification: **No Data** Approved by Variance: **No Data**
Surface Completion:	**Surface Slab Installed**

Water Level:	Static level: **No Data** Artesian flow: **No Data**
Packers:	**No Data**
Plugging Info:	Casing or Cement/Bentonite left in well: **No Data**
Type Of Pump:	**No Data**
Well Tests:	**No Data**

Water Quality:	Type of Water: **No Data** Depth of Strata: **No Data** Chemical Analysis Made: **No Data** Did the driller knowingly penetrate any strata which contained undesirable constituents: **No**
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 log(s) being returned for completion and resubmittal.
Company Information:	**ETTL Engineers & Consultants Inc.** **1717 E. Erwin**

	Tyler , TX 75702
Driller License Number:	**2126**
Licensed Well Driller Signature:	**Doug Hinds**
Registered Driller Apprentice Signature:	**No Data**
Apprentice Registration Number:	**No Data**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner of 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 (Tracking **#46655**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0-7 Silty clay - brown & bluish gray
7-58 Sand - brown, greenish gray, & yellow

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
4 New PVC Sch. 40 0 - 45
4 New PVC Sch. 40 - slotted 45 - 55 0.010"

ENCLOSURE 2

TCEQ CORE DATA FORM

00954203

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☐ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number (if issued)	Follow this link to search for CN or RN numbers in Central Registry**	**3. Regulated Entity Reference Number (if issued)**
CN		RN

SECTION II: Customer Information

4. General Customer Information	**5. Effective Date for Customer Information Updates** (mm/dd/yyyy)	01/31/2020

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)* *If new Customer, enter previous Customer below:*

7. TX SOS/CPA Filing Number	**8. TX State Tax ID** (11 digits)	**9. Federal Tax ID** (9 digits)	**10. DUNS Number** *(if applicable)*

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☐ **Yes** ☐ **No**

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following:*

☐ Owner ☐ Operator ☐ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:

City		**State**		**ZIP**		**ZIP + 4**	

16. Country Mailing Information *(if outside USA)*	**17. E-Mail Address** *(if applicable)*

18. Telephone Number	**19. Extension or Code**	**20. Fax Number** *(if applicable)*
( ) -		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC.)

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

23. Street Address of the Regulated Entity: *(No PO Boxes)*							
	City		State		ZIP		ZIP + 4
24. County							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	LHAAP is located in the northeast corner of Harrison County between SH43 and the western shore of Caddo Lake

26. Nearest City	State	Nearest ZIP Code
Karnack	TX	75661

27. Latitude (N) In Decimal:	32.677922		28. Longitude (W) In Decimal:	94.140436	
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
32	40	40.512	94	8	25.569

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

34. Mailing Address:							
	City		State		ZIP		ZIP + 4
35. E-Mail Address:							

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
( ) -		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:		41. Title:	
42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
( ) -		( ) -	

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:		**Job Title:**	
Name*(In Print)* **:**		**Phone:**	( ) -
Signature:		**Date:**	

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

March 2, 2020

DAIM-ODB-LO

Mr. William Rhotenberry
U.S. Environmental Protection Agency
Federal Facilities Section R6
1201 Elm Street, Suite 500
Dallas, TX 75202-2102

Re: LHAAP-18/24 Record of Decision, December 2019
Longhorn Army Ammunition Plant, Karnack, Texas

Dear Mr. Rhotenberry,

Enclosed please find the December 2019 LHAAP-18/24 Record of Decision (ROD) for your records. This is the final ROD and includes the completed signature page with Army and EPA signatures, and the TCEQ concurrence.

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.

Sincerely,

Rose M. Zeiler

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

One Enclosure
Copies furnished:

A. Palmie, TCEQ, Austin, TX
A. Williams, USACE, Tulsa District, OK
K. Nemmers, Bhate
P. Bruckwicki, Caddo Lake NWR, TX
A. Maly, USAEC, San Antonio, TX
R. Smith, USACE, Tulsa District, OK
P. Werner, HDR

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

March 2, 2020

DAIM-ODB-LO

Ms. April Palmie
Texas Commission on Environmental Quality
Remediation Division
12100 Park 35 Circle, Bldg D
Austin, TX 78753

Re: LHAAP-18/24 Record of Decision, December 2019
Longhorn Army Ammunition Plant, Karnack, Texas

Dear Ms. Palmie,

Enclosed please find the December 2019 LHAAP-18/24 Record of Decision (ROD) for your records. This is the final ROD and includes the completed signature page with Army and EPA signatures, and the TCEQ concurrence.

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.

Sincerely,

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

One Enclosure
Copies furnished:

W. Rhotenberry, USEPA, Dallas TX	A. Williams, USACE, Tulsa District, OK	K. Nemmers, Bhate
P. Bruckwicki, Caddo Lake NWR, TX	A. Maly, USAEC, San Antonio, TX	R. Smith, USACE, Tulsa District, OK
P. Werner, HDR		

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 6, 2020

Mr. Thomas E. Lederle
Chief, DCS G-9 BRAC Division
2530 Crystal Drive, Suite 1400
Taylor Bldg./NC3
Arlington, VA 22202

Subject: Record of Decision for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant Federal Superfund Site TX6213820529 Karnack, Harrison County, Texas

Dear Mr. Lederle:

The Texas Commission on Environmental Quality (TCEQ) received the final Record of Decision (ROD) for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant Federal Superfund Site in Karnack, Texas on January 9, 2020. The TCEQ has completed the review of the above referenced document and concurs that the described action is appropriate.

Sincerely,

Toby Baker
Executive Director

cc: Ms. Wren Stenger, Director, Superfund Division, US Environmental Protection Agency, Region 6

00954208

Final

Record of Decision

for LHAAP-18/24,
Burning Ground No. 3 and
Unlined Evaporation Pond
Longhorn Army Ammunition Plant
Karnack, Texas

December 2019

Prepared For:

U.S. Army Corps of Engineers – Tulsa District

Prepared By:

HDR
9871 S. Meridian Blvd, Suite 400
Englewood, CO 80112

Contract No. W912BV-15-D-0014
Task Order No. W912BV18F0023

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Final

RECORD OF DECISION

FOR

LHAAP-18/24, BURNING GROUND NO. 3 AND UNLINED EVAPORATION POND LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

Prepared For:

U.S. Army Corp of Engineers Tulsa District

Prepared By:

HDR, Inc.
9871 S. Meridian Blvd, Suite 400
Englewood, CO 80112

Contract No. W912BV-15-D-0014
Task Order No. W912BV18F0023

December 2019

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Table of Contents

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Acronyms and Abbreviations

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
ACD	air curtain destructor
ARAR	applicable or relevant and appropriate requirement
BERA	baseline ecological risk assessment
bgs	below ground surface
BHHRA	baseline human health risk assessment
°C	degrees Celsius
CDI	chronic daily intake
CDM	Camp, Dresser & McKee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
COPEC	chemical of potential ecological concern
COPC	chemical of potential concern
CSM	conceptual site model
CWA	Clean Water Act of 1972
DCE	dichloroethylene
DNAPL	dense non-aqueous phase liquid
DPT	Direct push technology
ECP	environmental condition of property
EEQ	ecological effects quotient
EISB	Enhanced in-situ bioremediation
EPC	exposure point concentration
EPS	Environmental Protection Systems
ERH	Electrical resistance heating
ESD	Explanation of Significant Differences
EVO	emulsified vegetable oil
FBR	fluidized bed reactor
FFA	Federal Facility Agreement
FS	Feasibility Study
ft	feet
ft^2	square feet
gpm	gallons per minute
$^{GW}GW_{Ing}$	Tier 1 Residential Groundwater Protecive Concentration Level (PCL)
GWQA	Groundwater Quality Assessment
GWP-Ind	TCEQ soil MSC for industrial use based on groundwater protection
GWTP	Groundwater treatment plant
HDR	HDR Environmental, Operations and Construction, Inc.
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HQ	hazard quotient
ICT	interceptor-collection trench
IRA	Interim Remedial Action
IRIS	Integrated Risk Information System
ISM	In Situ Microcosm
ISTD	In-situ thermal desorption
Jacobs	Jacobs Engineering Group
LHAAP	Longhorn Army Ammunition Plant
LTM	long-term monitoring

LUC	land use control
MC	methylene chloride
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/kg-day	milligrams per kilogram per day
MNA	monitored natural attenuation
MOA	memorandum of agreement
MSC	medium-specific concentration
NA	natural attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	no-observed adverse effect level
NPL	National Priorities List
O&M	operation and maintenance
ORC	oxygen release compound
OSHA	Occupational Safety and Health Administration
PCE	tetrachloroethene
PCL	Protective concentration level
PP	Proposed Plan
PPE	Personal protective equipment
PSI	Post-Screening Investigation
RAB	Restoration Advisory Board
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RfD	reference dose
RI	remedial investigation
ROD	record of decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SF	slope factor
Shaw	Shaw Environmental, Inc.
SIP	stable isotope probing
STEP	Solutions to Environmental Problems, Inc.
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TAC	Texas Administrative Code
TCA	trichloroethane
TCDD	tetrachlorodibenzo-p-dioxin
TCE	trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TCH	Thermal conduction heating
TEC	toxicity equivalence concentration
TNB	trinitrobenzene
TNT	trinitrotoluene
TOC	total organic carbon
TRRP	Texas Risk Reduction Program
TRRP Residential Groundwater PCL	Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level
TRV	toxicity reference level
UCL	upper confidence limit
UEP	Unlined Evaporation Pond
U.S.	United States
U.S. Army	U.S. Department of the Army

USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UTL	Upper tolerance limit
UU/UE	unlimited use/unrestricted exposure
VC	vinyl chloride
VOC	volatile organic compound
yd^3	cubic yards
ZVI	zero-valent iron

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1. The Declaration

1.1 Site Name and Location

Longhorn Army Ammunition Plant (LHAAP) -18/24, Burning Ground No. 3 and Unlined Evaporation Pond (UEP)
Longhorn Army Ammunition Plant
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System, U.S. Environmental Protection Agency (USEPA) Identification Number: TX6213820529.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the selected remedy for LHAAP-18/24, Burning Ground No. 3 and UEP, located at LHAAP in Karnack, Texas. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. §§9601, et seq.), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Code of Federal Regulations (C.F.R.) Title 40 §§ 300 et seq.

The remedy selection was based on documentation available in the Administrative Record for the site, including the remedial investigation (RI) (Jacobs Engineering Group, Inc. [Jacobs], 2001), baseline human health risk assessment (BHHRA) report (Jacobs, 2002), installation-wide baseline ecological risk assessment (BERA) report (Shaw Environmental, Inc. [Shaw], 2007), baseline ecological risk assessment addendum (BERA) report (AGEISS, 2014), feasibility study (FS) (AECOM, 2017), post-screening investigation (PSI) (AECOM, 2013), updated PSI (AECOM, 2016a), and supplemental to updated PSI (AECOM, 2016b) and proposed plan (PP) (U.S. Department of the Army [U.S. Army], 2019).

This document is issued by the U.S. Army, the lead agency for this installation. The U.S. Army, USEPA, and the Texas Water Commission (currently known as the Texas Commission on Environmental Quality [TCEQ]) entered into the Federal Facility Agreement (FFA) for remedial activities at LHAAP which became effective on December 30, 1991. The USEPA (Region 6) and the TCEQ are the regulatory agencies providing technical support, project review and comment, and oversight of the LHAAP cleanup program. The USEPA and the U.S Army jointly select the remedy and TCEQ concurs with the selected remedy in this ROD.

1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

1.4 Description of the Selected Remedy

The final selected remedy for LHAAP-18/24 includes enhanced groundwater extraction and treatment, Land Use Controls (LUCs), enhanced in-situ bioremediation (EISB) for Shallow Zone and

Wilcox formation groundwater inside and outside the containment area, thermal dense non-aqueous phase liquid (DNAPL) removal, maintenance of the existing cap over the UEP, unsaturated soil excavation and off-site disposal, Monitored Natural Attenuation (MNA) and long term monitoring.

The final selected remedy for LHAAP-18/24 protects human health and the environment by preventing human and ecological receptors from being exposed to contaminated soil and contaminated groundwater. The human health risk assessment scenarios evaluated were based on the hypothetical future maintenance worker. In the soil, chemicals of concern (COCs) are volatile organic compounds (VOCs) (trichloroethylene [TCE], methylene chloride [MC], tetrachloroethene [PCE]) and the anion perchlorate. In the Shallow Zone groundwater, COCs include VOCs (MC, TCE, cis-1,2-dichloroethylene [DCE], PCE, benzene, 1,1,2-trichloroethane [TCA], vinyl chloride, bromodichloromethane, 1,3,5-trinitrobenzene [TNB], and 1,4-dioxane), metals (arsenic, barium, chromium, cobalt, and nickel), and the anion perchlorate. In the underlying Wilcox Formation groundwater, COCs include VOCs (MC, TCE, cis-1,2-DCE, PCE, benzene,vinyl chloride, bromodichloromethane, 1,3,5-TNB,and 1,4-dioxane), metals (arsenic and barium), and the anion perchlorate. Residual MC and TCE DNAPL acting as a source material at two locations in the Shallow Zone and Wilcox Formation groundwater may be considered a principal threat waste at LHAAP-18/24.

The components of the selected remedy are summarized below:

- Continued use of the existing groundwater extraction system, as needed, with enhancements (including a potentially phased reactivation of two existing Interceptor-collection trenches (ICTs) [ICT 3 and 9]) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Continued operation of the current groundwater treatment plant (GWTP), or potentially a new GWTP as needed, will be determined during the remedial design phase. Should treatment for 1,4-dioxane be required, an advanced oxidation process will be implemented as a contingency remedy. Development and specific description of the contingency remedy would be presented in a Remedial Design/Remedial Action Work Plan (RD/RAWP).
- Excavation of unsaturated soil exceeding TCEQ soil medium-specific concentration (MSC) for industrial use based on groundwater protection (GWP-Ind). Additional confirmation soil sampling during the remedial design (RD) will be needed to define the final excavation extent and volume of soil contaminated in the two areas south of the UEP and area west of the UEP.
    - If during the Five-Year Review the results of the groundwater remedy indicate that vadose zone soil under the UEP constitutes a continuing source that requires a response, a contingency remedy to excavate soil beneath the UEP would be developed. Development and specific description of the contingency remedy would be presented in a Remedial Design/Remedial Action Work Plan (RD/RAWP).
- Implementation of enhanced in-situ bioremediation (EISB) of Shallow Zone groundwater outside the containment area at several locations; in the Wilcox Formation at three or more locations, and inside the containment at five or more locations or as needed.
- Implementation of in-situ thermal desorption (ISTD), using either Electrical Resistance Heating (ERH) or Thermal Conduction Heating (TCH), to remove DNAPL in two distinct areas inside the containment area.

- MNA for both Shallow Zone and Wilcox Formation groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas (after evaluation of EISB) to reduce contaminant levels to confirm protection of human health and the environment by documenting that the contaminated groundwater remains localized with minimal migration and that COCs are being reduced to cleanup levels.
    - Performance objectives will be evaluated after two years of MNA. During those two years, monitoring will be quarterly. If MNA is found to be effective, it will be continued, and long-term monitoring (LTM) will be semiannual for three years. In subsequent years, LTM will be annual until the next five-year review and annually thereafter until recommended otherwise by the five-year review. The monitoring and reporting associated with this remedy will be used to track the effectiveness of MNA and will continue until recommended otherwise at the five-year review.
    - If MNA is found to be ineffective, a contingency remedy to enhance MNA would be developed. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Development and specific description of the contingency remedy would be presented in a Remedial Design/Remedial Action Work Plan (RD/RAWP).
- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year intervals.
- Maintenance of existing cap over the former UEP. The need to continue cap maintenance will be evaluated at five year intervals.
- Long-term monitoring and reporting would continue until the cleanup levels are achieved.
- The LUC's objectives include maintaining the integrity of any current or future remedial or monitoring systems, preserving the integrity of the surface impoundment cap over the UEP and to restrict intrusive activities (e.g., digging) that would degrade or alter the cap, and preventing the use of groundwater contaminated above cleanup levels as a potable water source. The groundwater treatment and MNA remedial components include a groundwater monitoring system that will be used to characterize the condition of the groundwater during the period the groundwater remedy is in place until the groundwater remediation goals are achieved, and to demonstrate achievement of the groundwater remediation goals when the groundwater remedy is complete. As a part of this groundwater remedy, the U.S. Army will maintain the remedial and monitoring systems associated with the groundwater remedies until these components of the remedy are no longer needed to achieve cleanup levels, and when these levels have been achieved. During the period of operation of the groundwater remedy, if any of the elements of the remedial and groundwater monitoring systems are damaged, destroyed, or become ineffective, they will be repaired or replaced with suitable components to ensure that the remedial and groundwater monitoring systems are able to provide data of the quality necessary to determine the progress of and eventual completion of this component of the remedy. The actions to be taken to implement these LUC objectives and requirements will be provided through modifying the "Comprehensive LUC Management Plan, Former Longhorn Army Ammunition Plant, Karnack, Texas" and detailed in the LUC RD. [1]

[1] This paragraph is October 31, 2014 Dispute Decision language that is included despite the ROD not being subject to the dispute.

- The LUC for prohibition of groundwater use (except for monitoring and testing) shall be implemented and shall remain in place at the Site until the COCs (i.e. including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soil and groundwater remaining at the Site are reduced below levels that would support unlimited use and unrestricted exposure (UU/UE). A LUC RD will be finalized as the land use component of the RD. Within 21 days of the issuance of the ROD, the U.S. Army will propose deadlines for completion of the RD Work Plan, RD and Remedial Action Work Plan. The documents will be prepared and submitted to the USEPA and the TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. The long-term groundwater and surface water monitoring and MNA performance monitoring plan will also be presented in the RD. The recordation notification for the Site, which will be filed with Harrison County, will include a description of the LUCs.[1] The preliminary boundary for the groundwater LUC is shown on **Figure 2-18**.

- The LUC restricting land use to nonresidential shall be implemented until it is demonstrated that surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for UU/UE.[1]

- The LUC to maintain the integrity of any current or future remedial or monitoring systems will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met. The LUC to prohibit groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs (i.e., all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soil and groundwater allow for UU/UE.[1]

- The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g, digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

CERCLA five-year reviews will be conducted until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soil and groundwater allow for UU/UE.

Under this remedial alternative, two ISTD technologies (ERH or TCH) will be considered during the Remedial Design phase to treat the high concentration of dissolved VOCs and DNAPL in the Shallow Zone and Wilcox Formation groundwater. While the technology is more expensive, it is very effective in low permeability zones where the majority of the residual DNAPL resides. A removal rate of 99.9% is expected. EISB would be applied to the thermally-treated areas as a polishing step after thermal treatment is completed. LUCs would be implemented to restrict land use to nonresidential uses until it is demonstrated that COCs in soil and groundwater are reduced to levels that would allow for UU/UE. Maintenance of the UEP cap will continue. It is estimated that this alternative allows achievement of the remedial action objectives (RAOs) within 20 years. Considering the lithologic variability, particularly the lateral and vertical change from sand to clay, the times to achieve cleanup levels may vary by an order of magnitude. In the course of the remedy, the additional monitoring results will allow more accurate time estimates.

No adverse impact is expected to the surface water during the time it would take natural attenuation to reduce contaminant concentrations to cleanup levels.

A LUC RD will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD, the U.S. Army will propose deadlines for completion of the RD Work Plan, RD, and Remedial Action Work Plan. The documents will be prepared and submitted to USEPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. The long-term groundwater and surface water monitoring and MNA performance monitoring plan will also be presented in the RD. [1]

The U.S. Army will implement, maintain, monitor, report on and enforce LUCs at U.S. Army-owned property. The U.S. Army shall perform those actions related to land use control activities described in this ROD and in the RD for the ROD. For portions of the Site subject to LUCs that are not owned by the U.S. Army, the U.S. Army will monitor and report on the implementation, maintenance, and enforcement of LUCs, and coordinate with federal, state, and local governments and owners and occupants of properties subject to LUCs. The U.S. Army will provide notice of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. The U.S. Army will send these notices to the federal, state and local governments involved at this Site and the owners and occupants of the properties subject to those use restrictions and LUCs. The U.S. Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the RD for the ROD. The U.S. Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The U.S. Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.[1]

Upon transfer of U.S. Army-owned property, the U.S. Army will provide written notice of the LUCs to property, the transferee of the groundwater and soil (surface and subsurface) contamination, and any land use restrictions referenced in the ROD. Within 15 days of transfer, the U.S. Army shall provide the USEPA and the TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the U.S. Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the LUCs relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the State of Texas. [1]

The U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUC objective at this Site after it has been transferred.

The management strategy at LHAAP is to approach each site separately to address human health issues and to approach the sites by sub-area to address ecological risk (Shaw, 2007a). Thus, the implementation of this remedy at LHAAP-18/24 is independent of any other remedial action at LHAAP to address human health issues. To address ecological risk, LHAAP-18/24 was grouped with several other sites as part of the Industrial Sub-Area. Ecological hazards were found to be acceptable for the Industrial Sub-Area that includes LHAAP-18/24 (Shaw, 2007a). This management strategy is considered to be endorsed by regulators as evidenced by the regulatory approval of the BERA (Shaw, 2007a) and BERA Addendum (AGEISS, 2014). Therefore, no action is required for environmental receptors.

1.5 Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate for the remedial action, is cost-effective, and provides a permanent solution.

In addition, the remedy offers long-term effectiveness through excavation and disposal of contaminated soil; ISTD DNAPL removal; EISB of shallow and Wilcox Formation groundwater; continued use of the existing groundwater extraction system, as needed, with enhancements; contingency use of advanced oxidation process for ex-situ treatment of 1,4-dioxane in groundwater; and, the implementation of LUCs, which will minimize the potential risk to the hypothetical future maintenance worker posed by the contaminated soil and groundwater. Evaluation of MNA including routine monitoring of the attenuation until cleanup levels are met will document the effectiveness of the selected remedy. In the event that MNA is determined to be ineffective, a contingency remedy consisting of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations will be developed and implemented. Development and specific description of the contingency remedies will be presented in a RD/RAWP. The selected remedy is easily and immediately implementable and has a moderate cost compared to the other alternatives considered for LHAAP-18/24, with the exception of the no action alternative.

The selected remedy would reduce the toxicity, mobility, or volume of contaminants in the groundwater through active and passive remedial actions. This response will permanently reduce the toxicity, mobility, and volume of source materials that constitute the principal threat wastes at the Site. The thermal treatment and EISB components of the selected remedy satisfy the statutory preference for treatment as principal treatment elements of the remedy. The MNA component does not address the statutory preference for treatment to the maximum extent practicable; MNA is a passive remedial action using natural processes.

Unsaturated soil known to contain residual contamination posing a low-level threat to groundwater is isolated to locations south of the former UEP, west of the UEP, and underneath the UEP. The potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway that will be addressed by excavation during the remedial action. The high concentrations of TCE and MC in the shallow zone and Wilcox Formation indicate in two locations that residual DNAPL may be acting as a principal threat waste in the groundwater. Therefore, the presence of source materials in groundwater is considered a complete transport pathway that will be addressed with ISTD during the remedial action.

Because hazardous substances, pollutants, or contaminants will remain at the site above levels that allow for UU/UE, a five-year review will be conducted to confirm protection of human health and the environment under CERCLA §121(c), U.S. Code (USC) Title 42 §9621(c). In accordance with Texas Administrative Code (TAC) Title 30 §335.566, a notification will be recorded in Harrison County records restricting land use to nonresidential until it is demonstrated that surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for UU/UE; that a prohibition of groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soil and groundwater allow for UU/UE; and, that the integrity of any current or future remedial or monitoring systems will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met.

Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army shall retain ultimate responsibility for remedy integrity per the FFA and CERCLA §121.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this Site.

- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater as identified in the baseline risk assessment and ROD (**Section 2.6**).
- Potential groundwater use that will be available at the sites as a result of the selected remedy (**Section 2.6**).
- COCs and their concentrations (**Section 2.7**).
- Baseline risk represented by the COCs (**Section 2.7**).
- Cleanup levels established for COCs and the basis for these levels (**Sections 2.7.3** and **2.8**).
- Principal threat wastes that will be addressed at this Site (**Section 2.11**).
- Key factor(s) that led to selecting the remedy (**Section 2.12**).
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (**Section 2.12**).

1.7 Authorizing Signatures

As the lead agency, the U.S. Army issues this ROD for LHAAP-18/24 which documents the final selected remedy. The undersigned is the appropriate approval authority for this decision.

Thomas E. Lederle _______________ 2 January 2020
(Date)

Thomas E. Lederle
Division Chief
Base Realignment and Closure Division
Office of the Deputy Chief of Staff, G9 (Installations)
U.S. Army

The United States Environmental Protection Agency approves the selected remedy as provided in the ROD for LHAAP-18/24.

Wren Stenger _______________ 2/25/20
(Date)

Wren Stenger
Director
Superfund Division
U.S. Environmental Protection Agency
Region 6

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2. Decision Summary

2.1 Site Name, Location, and Description

LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond
Longhorn Army Ammunition Plant
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System USEPA Identification Number: TX6213820529

Lead Agency: U.S. Army, Department of Defense
Support Agencies: USEPA Region 6, TCEQ

Source of Cleanup Money: U.S. Army, Department of Defense
Site Type: Industrial Facility

The former LHAAP is an inactive, government-owned, formerly contractor operated and maintained, Department of Defense facility located in central east Texas (see **Figure 2-1**) 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 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 Superfund 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 TCEQ) entered into a CERCLA §120 FFA for remedial activities at LHAAP. The FFA became effective 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, not including LHAAP-18/24, has been transferred by the U.S. Army to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge.

LHAAP-18/24 is a 34.5-acre cleared area within a heavily wooded section of LHAAP (**Figure 2-2**). The area is vegetated primarily with grass and has asphalt-paved roads. It is situated on a natural topographic high slightly west of the crest of a small topographic divide between Harrison Bayou and Saunders Branch. Topography of the Site has been altered by operations over the past 35 years. The burning ground area is mostly level with more relief near the western corner and near the northern corner that contains the mounded surface of the former UEP. There are no surface water bodies or watercourses running through LHAAP-18/24. Surface drainage occurs in all directions, but flow is generally directed to the north and west by both natural and manmade ditches and drainage swales towards Harrison Bayou. Harrison Bayou drains into Caddo Lake which is located approximately 2.5-miles northeast of LHAAP-18/24 (Jacobs, 2001).

2.2 Site History and Enforcement Activities

2.2.1 History of Site Activities

LHAAP was established in December 1941 with the primary mission of manufacturing trinitrotoluene (TNT). Production of TNT began at Plant 1 in October 1942 and continued through World War II until August 1945, when the facility was placed on standby status until February 1952. In 1952, the LHAAP facility was reactivated with the opening of Plant 2, where pyrotechnic ammunition, such as photoflash bombs, simulators, hand signals, and tracers for 40 millimeter ammunition, were produced until 1956.

In December 1954, a third facility, Plant 3, began production of solid-fuel rocket motors for tactical missiles. Rocket motor production at Plant 3 continued to be the primary operation at LHAAP until 1965 when Plant 2 was reactivated for the production of pyrotechnic and illuminating ammunition. In the years following the Vietnam conflict, LHAAP continued to produce flares and other basic pyrotechnic or illuminating items for the U.S. Department of Defense inventory. From September 1988 to May 1991, LHAAP was also used for the static firing and elimination of Pershing I and II rocket motors in compliance with the Intermediate-Range Nuclear Force Treaty in effect between the United States and the former Union of Soviet Socialist Republics. 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.

LHAAP-18/24 is comprised of the former Burning Ground No. 3 (LHAAP-18) and UEP (LHAAP-24). LHAAP-18 Burning Ground No. 3 operated between 1955 and 1998, while LHAAP-24 UEP was operational from 1963 to 1984. The area was used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent waste by open burning/open detonation, incineration, evaporation, and burial (Jacobs, 2001). The UEP was used to collect water from the washout of rocket motor casings and process waste sumps. Sludge from the UEP was removed in 1986 and the impoundment was capped. The majority of impacts to the soil were remediated during the 1997 LHAAP-18/24 Interim Remedial Action (IRA) when approximately 32,000 yd^3 of soil was removed. A groundwater extraction system incorporating approximately 5,000 feet (ft) of ICTs and a GWTP was installed in 1997 to control the migration of contaminated groundwater and to protect surface water. The area within the ICTs is considered the containment area. Harrison Bayou is located adjacent to the Site and drains to Caddo Lake, a drinking water supply.

2.2.2 History of Investigative Activities

As part of the Installation Restoration Program, the U.S. Army began an environmental investigation in 1976 at LHAAP followed by installation-wide assessments/investigations. Pre-Phase I investigations were conducted at LHAAP-18/24 from 1980 to 1987. Data analyses from previous investigations have been summarized by the U.S. Army Corps of Engineers (USACE) -Tulsa District in the report *A Data Summary Report of Investigation Results from 1976 through 1992 for Burning Ground 3 and the Unlined Evaporation Pond* (USACE, 1993). Additionally, Phase I through Phase III investigations were performed after 1993. Pre-Phase I and Phase I - Phase III investigations are summarized below.

- **Pre-Phase I Investigations:**
  - o During the LHAAP-18/24 investigation in 1980, the United States Army Environmental Hygiene Agency (USAEHA) installed monitoring wells and collected

groundwater samples for laboratory analysis of anions, explosive compounds, metals, phenols, and physical/chemical characteristics (USAEHA, 1980).

- In 1982, Environmental Protection Systems (EPS) investigated the Site for the United States Army Toxic and Hazardous Materials Agency (USATHAMA) (EPS, 1984). As part of this investigation, an additional nine groundwater monitoring wells were installed at Site 18/24. Twenty-two groundwater samples were collected, nine from the newly installed monitoring wells and 13 from existing monitoring wells.
- As part of the Groundwater Quality Assessment (GWQA) investigations, Camp, Dresser & McKee (CDM) installed ten monitoring wells around LHAAP-18/24 (CDM, 1986). Groundwater samples from the ten newly installed monitoring wells and 18 existing monitoring wells were collected and analyzed for metals, total organic carbon (TOC), selected anions, VOCs and explosive compounds. CDM concluded that the UEP was a source of groundwater contamination, but not the primary source for all of the contaminants identified, including nitrate and organic contamination in the groundwater (along the western edge of the burning ground) and barium (south of the burning ground boundary).
- In 1987, EPS performed a site investigation at LHAAP-18/24 for the Thiokol Corporation and published a report in May 1988 (EPS, 1988). Groundwater samples were collected from three existing monitoring wells and analyzed for explosive compounds.

- **Remedial Investigation – Phase I, II, and III**
  - Numerous investigations to determine the nature and extent of contamination in the soil, groundwater, surface water, and sediments at LHAAP-18/24 were conducted during Phase I, Phase II, and Phase III investigations in 1993, 1995, and 1998, respectively (Sverdrup Environmental, Inc., 1993, 1996a, 1996b, 1999). Activities included installation of monitoring wells and analysis of groundwater, surface water, soil, and sediment samples. Samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), metals, explosive compounds, perchlorate, pesticides, PCBs, and/or dioxins/furans, depending on the focus of the investigation. The Phase I, Phase II, and Phase III investigations at LHAAP-18/24 are documented in the Group 2 Sites RI (Jacobs, 2001).

- **Plant-wide perchlorate investigation**: The groundwater investigation was conducted from 2000 through 2002 (Solutions to Environmental Problems, Inc. [STEP], 2005) to delineate perchlorate contamination.
- **Baseline Human Health Risk Assessment and Screening Ecological Risk Assessment**: The BHHRA (Jacobs, 2002) used data from the investigations conducted through 2001, including the plant-wide perchlorate investigation results up to that time. The report concluded that the soil at LHAAP-18/24 posed a non-carcinogenic hazard and the groundwater posed unacceptable carcinogenic risk and non-carcinogenic hazard to the hypothetical future maintenance worker. The Ecological Risk Assessment did not identify potential risk to ecological receptors at LHAAP-18/24.

- **Baseline Ecological Risk Assessment**: The BERA (Shaw, 2007a) identified chemicals of potential ecological concern (COPECs) for the Industrial Sub-Area. The evaluation was based on environmental investigations from 1993 to 2004.
- **Post-Screening Investigations**: Additional investigations were conducted in 2013, 2014, and 2016 in an attempt to improve the Conceptual Site Model (CSM) and assess for the presence of source areas (unsaturated soil and DNAPL in the saturated Shallow Zone). These investigations are documented in the *Final Post-Screening Investigation Report for LHAAP-18/24* (AECOM, 2013), the *Final Updated Post-Screening Investigation Report – LHAAP-18/24* (AECOM, 2016a) and the *Draft Final Supplemental to the Updated Post-Screening Investigation Report, LHAAP-18/24* (AECOM, 2016b).
- **Baseline Ecological Risk Assessment Addendum**: Conducted in 2014, the BERA Addendum did not change the conclusion of the 2007 BERA (AGEISS, 2014).
- **Natural Attenuation Evaluation**: A preliminary evaluation was conducted to determine the occurrence of NA of MC, TCE, and perchlorate in the Shallow Zone and Wilcox Formation groundwater at LHAAP-18/24. Evaluation was performed for the purpose of determining whether the process is a viable remedial technology to be applied at the Site (AECOM, 2017; Appendix A).
- **Revised Feasibility Study**: The Revised FS was based on all available results from previous investigations through 2016. The CSM was refined and RAOs were developed in the FS. The FS identified and evaluated six remedial alternatives (including the no action alternative) to address the soil contamination and groundwater contamination in the Shallow Zone and Wilcox Formation (AECOM, 2017).

Figure 2-3 shows the locations for all of the investigations conducted at LHAAP-18/24.

2.2.3 Site History of CERCLA Enforcement Activities

Due to the releases of chemicals from facility operations, the USEPA placed LHAAP on the Superfund NPL on August 9, 1990. Activities to remediate contamination associated with the listing of LHAAP as a Superfund site began in 1990. After the listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered a CERCLA §120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP-18/24 was one of the originally listed NPL sites in the FFA. The Revised FS for LHAAP-18/24 (AECOM, 2017) was issued in January 2017, and the Proposed Plan (U.S. Army, 2019) was issued in February 2019. This ROD follows that Proposed Plan (PP) and precedes the more detailed RD.

2.3 Community Participation

The U.S. Army, USEPA, TCEQ and the LHAAP Restoration Advisory Board (RAB) have provided public outreach to the surrounding community concerning LHAAP-18/24 and other environmental sites at LHAAP. The outreach program has included fact sheets, media interviews, site visits, invitations to attend quarterly RAB meetings, and public meetings consistent with its public participation responsibilities under Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of CERCLA.

The Final Proposed Plan (U.S. Army, 2019) for the selection of the remedy for LHAAP-18/24 was released to the Administrative Record and made available to the public for review and comment beginning April 2, 2019. The notice of availability of the PP and other related documents in the Administrative Record file was published in *The Shreveport Times* and the *Marshall News Messenger* on April, 2 2019. The newspaper and media notices for the meeting are provided in **Appendix A**. The public comment period for the PP began on April 2, 2019 and ended May 2, 2019. A public meeting was held on April 25, 2019 in a formal format and with a court reporter. The transcript for the meeting is part of the Administrative Record. The significant comments received from the public (oral or written) are addressed in the Responsiveness Summary, which is included in this ROD as **Section 3.0**.

The Administrative Record may be found locally at the information repository maintained at the following location and at http://www.longhornaap.com/:

Location: Marshall Public Library
300 S. Alamo
Marshall, Texas 75670

Business Hours: Monday, Tuesday, Thursday (9:30 AM – 7:30 PM)
Wednesday and Friday (9:00 AM – 5:30 PM)
Saturday (9:30 AM – 3:30 PM)

2.4 Scope and Role of Response Action

The response action will prevent potential risks associated with exposure to contaminated soil and groundwater in both the Shallow Zone and Wilcox Formation. Present as residual DNAPLs in groundwater near the UEP and the ACD, TCE and MC are highly toxic materials constituting principal threat wastes. Treatment of the residual DNAPLs will remove continuing sources of groundwater contamination. TCE and MC are also present in unsaturated soils in isolated locations south of the former UEP, west of the UEP, and underneath the UEP acting as a low-level threats to groundwater. The removal of source soils will positively impact groundwater by eliminating the potential for the leaching of contaminants from the soil into the groundwater and will remove the contamination that poses a risk to ecological receptors.

The selected action at LHAAP-18/24 will prevent potential risks associated with exposure to contaminated groundwater. Although groundwater at LHAAP is not currently being used as drinking water, nor may it be used in the future based on its reasonably anticipated use as a national wildlife refuge, when establishing the RAOs for this response action, the U.S. Army has considered the NCP's expectation to return usable groundwater to its potential beneficial uses wherever practicable and in a timeframe that is reasonable given the particular circumstances of the site (40 C.F.R. § 300.430(a)(1)(iii)(F)). The U.S. Army has also considered the State of Texas designation of all groundwater as potential drinking water, unless otherwise classified, and consistent with 30 TAC 335.563(h)(1) [background total dissolved solids (TDS) content less than or equal to 10,000 milligrams per liter (mg/L) and that occurs within a geologic zone that is sufficiently permeable to transmit water to a pumping well in usable quantities].

The U.S. Army intends to return the contaminated Shallow Zone and Wilcox Formation groundwater zones at LHAAP-18/24 to their potential beneficial uses, which for the purposes of this ROD is considered to be attainment of the Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) to the extent practicable, and consistent with 40 C.F.R. §300.430(e)(2)(i)(B)&(C). In the absence of federal drinking water standards, clean-up levels will be based on the Texas Risk

Reduction Program (TRRP) Tier 1 Residential Groundwater Protective Concentration Level (PCL). The TCEQ soil medium specific concentration (MSC) for industrial use based on groundwater protection (GWP-Ind) is used in accordance with 30 TAC 335.559(g)(2). If a return to potential beneficial uses is not practicable, the NCP expectation is to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction.

The selected remedial action will also ensure containment of the plume to prevent potential impact to surface water. The selected action will include groundwater monitoring to demonstrate that the plume is not migrating at levels that present a potential impact to surface water bodies and to verify that contaminant levels are being reduced to cleanup levels when the LUC for groundwater use prohibition may be terminated.

In addition, the selected action includes excavation that will mitigate the residual contamination in the unsaturated soil that is considered a low-level threat waste. The relevant active remedial components of the selected action include EISB inside and outside the containment area and in the Shallow and Wilcox Formation, ISTD DNAPL removal, and enhanced groundwater extraction and treatment as needed. By instituting these technologies, the selected action will comply with NCP expectations regarding treatment of affected media where principal threat waste may be considered.

2.5 Site Characteristics

This section of the ROD presents a brief comprehensive overview of the LHAAP-18/24 site characteristics with respect to the CSM, physical site features, known or suspected sources of contamination, types of contamination, and affected media. Known or potential routes of contaminant migration are also discussed. Detailed information about the site characteristics can be found in the RI (Jacobs, 2001).

2.5.1 Conceptual Site Model

LHAAP-18/24 is a 34.5-acre site that has been impacted primarily with VOCs and perchlorate. As illustrated on **Figure 2-4**, the CSM presents the human health pathways that are complete and being considered for remediation. Those pathways that are likely to be incomplete or have negligible impact are not being considered for remediation as discussed below. The BERA and BERA Addendum did not identify potential risk to ecological receptors at LHAAP-18/24 (Shaw, 2007, AGEISS, 2014).

The area was previously used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent waste by open burning/open detonation, incineration, evaporation, and burial. Historical waste management units include open burn pits, the UEP, stockpiles of solvent-soaked sawdust, and suspected waste burial pits. The UEP was constructed at the burning ground in 1963 as a holding pond to store explosive wastes resulting from the washout of rocket motor casings. In 1973, the pond also began receiving waste water containing solvent residues and solids. An air curtain destructor (ACD) was built in 1979 for the purpose of disposing of explosive and explosive-contaminated wastes by burning. A groundwater extraction system incorporating approximately 5,000 ft of ICTs and a GWTP was installed in 1997 to control the migration of contaminated groundwater as an IRA (AECOM, 2017).

Contamination from historical activities at LHAAP-18/24 have impacted two groundwater zones: the shallow zone extending from the surface to a depth of approximately 45 ft below ground surface (bgs), and the Wilcox Formation below the shallow zone. These two units are separated by a mostly contiguous clay layer which is believed to be present across the entire Site with the exception of the area to the west and northwest towards Harrison Bayou.

VOCs and associated 1,4-dioxane, metals, and perchlorate releases associated with past operations of the former burn pits, burial trenches, the ACD, and the UEP were the contamination sources in soil at LHAAP-18/24. An IRA performed in 1997 removed approximately 32,000 yd^3 of contaminated source area soil that was treated using low temperature thermal desorption. The majority of the contaminated soil was remediated during the IRA; however, some residual contaminants remain in the unsaturated soil. Based on the results of the BHHRA (Jacobs, 2002), the soil at LHAAP-18/24 does not pose an unacceptable carcinogenic risk or non-cancer hazard; however, the concentrations of contaminants in soil could be an ongoing source of groundwater contamination.

Unsaturated soil known to contain residual contamination posing a low-level threat to groundwater is isolated to locations south of the former UEP, west of the UEP, and underneath the UEP. Therefore, the potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway that will be addressed during the remedial action.

Other than the unsaturated soil locations with residual contamination, the medium of concern at LHAAP-18/24 is the groundwater. The contaminants in the saturated zone occur as dissolved plumes within the containment area and outside the containment area where contaminants have migrated off-site before the installation of the ICTs and GWTP. Additionally, residual DNAPL is present in the UEP and former ACD areas.

Groundwater contamination in the form of VOCs, 1,4-dioxane, metals, and perchlorate in the shallow zone and the Wilcox Formation poses a potential risk to the hypothetical future maintenance worker at LHAAP-18/24. Concentrations of VOCs and perchlorate were detected in wells screened in the shallow zone and in localized areas in the Wilcox Formation, though shallow zone contamination is more widespread. Since the groundwater at LHAAP-18/24 may pose a risk for the hypothetical future maintenance worker, the pathways considered for remediation include future industrial groundwater use.

The contaminants in the shallow zone groundwater migrate toward surface water and may discharge via seepage. Although this transport pathway is currently mostly mitigated by the operation of a groundwater extraction system, the seepage of groundwater to surface water represents a pathway that is addressed by the selected remedial action.

2.5.2 Geology and Hydrogeology

Surficial soils at LHAAP-18/24 consist of sandy silty clays and clays underlain by a sandy silt to silty sand stratum. This clay stratum pinches out to the east of the burning grounds and becomes ill defined at the contact between the Wilcox Group and the alluvium of Harrison Bayou to the west and north of the site (Jacobs, 2001).

The shallow alluvial zone at LHAAP-18/24 is very heterogeneous consisting of discrete sand channels encapsulated in lower permeability silt/clay floodplain sediments. The thickness of the shallow alluvium is variable, because of the irregular contact with underlying Wilcox. Thickness ranges from 10 to 40 ft. The zone is characterized by potentially complex flow paths, gradients depending on where sandy channel deposits intersect and/or diverge. In general, the axes of channel deposits trend toward the north and northeast (AECOM, 2015).

The permeable intervals (sands, silty sands) associated with individual channel fill or point bar sediment packages range in thickness from 10 to 20 ft thick generally. Sands are typically fine to medium grained. Many of the channel fill sand bodies include a percentage of silt. Levee or overbank sand bodies were identified where possible. Typically, the fine levee sands display an abrupt coarsening upward grain size trend, are 5 to 10 ft in thickness, and may have some evidence of root or soil formation in the form of noted “mottling” of the sediments (AECOM, 2015).

A clay unit separating the shallow alluvium from the Wilcox sands occurs at the top of the Wilcox Formation throughout most of the site. However, this clay is missing in the northwestern corner of the site. The clay is missing where fluvial incision has occurred during both the deposition of the shallow Wilcox (incision indicated by a well-defined gravel lag deposit at 18WW06 as well as later incision by the Harrison Bayou. The thickness and extent of the “Wilcox clay” layer varies in thickness from 0 to 20 ft and may be in contact with overlying floodplain silts and clays or incised by overlying channel sands. The sands of the Wilcox Formation are homogenous and vary in grain size from medium to fine silty sands (AECOM, 2015).

Figures 2-5 and **2-6** show the well locations and groundwater elevations for the Shallow Zone and Wilcox Formation, respectively.

2.5.3 Sampling Strategy

Numerous sampling events were conducted at LHAAP-18/24 from 1980 to 2016, as described in **Section 2.2.2**. Early investigations included collection of soil, sediment, and surface water samples, and installation of groundwater monitoring wells and groundwater sampling throughout the site to determine the areas of contamination. Subsequent investigations focused on the areas where contamination was found; performing additional soil, groundwater, surface water and sediment sampling; and installing additional groundwater monitoring wells to further delineate the nature and extent of contamination. Samples from all media were analyzed for various analytes including perchlorate, metals, VOCs, SVOCs, and 1,4-dioxane. In 2014, a treatability study for an In Situ Microcosm (ISM) study using stable isotope probing (SIP) was performed at the Site to determine whether the addition of oxygen release compound (ORC) or emulsified vegetable oil (EVO) would enhance the biodegradation of MC. During 2016, a preliminary evaluation of the occurrence of NA of MC, TCE, and perchlorate present in the shallow zone and Wilcox Formation groundwater at LHAAP-18/24 was performed. This analysis is important in determining if NA should be considered as a remedial process applicable at the site.

2.5.4 Nature and Extent of Contamination

The collective investigative results at LHAAP-18/24 identified groundwater contamination present at concentrations that pose an unacceptable risk to human health or the environment that require remedial action. TCE, MC and perchlorate present the vast majority of the human health risk in groundwater. The concentrations of TCE and MC in some portions of the site are sufficiently high to indicate the possible presence of DNAPL within the saturated zone. 1,4-dioxane is present as isolated plumes while occurrences of other VOCs and metals concentrations in groundwater are intermittent and their distribution is generally not contiguous across the site.

Soil has not been identified as a medium of concern for protection of human health and ecological risk; however, it was identified as a medium of potential concern for the protection of groundwater from potential cross-media transfer. Unsaturated soil exceedances are shown on **Figure 2-7**. Groundwater at LHAAP-18/24 has been identified as the medium of concern because of the risk it poses to a hypothetical future maintenance worker. Contaminant plumes for the shallow zone and the Wilcox Formation contaminants are illustrated on **Figures 2-8** through **2-11** and **Figure 2-12** through **2-15**, respectively. Contamination at LHAAP-18/24, as described in the *Final Revised Feasibility Study* (AECOM, 2017), is as follows:

Soil

- Unsaturated soil in two areas south of the former UEP contain TCE and MC as well as PCE at concentrations that exceed their respective GWP-Ind values and could leach to groundwater at concentrations exceeding the MCLs. The leaching of contaminants from the unsaturated soil to groundwater is considered a complete transport pathway that will be addressed during the remedial action. A more refined extent determination of COCs in the soil in these areas is recommended, but will be defined as part of the RD. The estimated in-place volumes are 414 yd^3 and 602 yd^3, respectively, with both areas having been previously excavated to a depth of 4 ft bgs.
- Unsaturated soil in the area west of the UEP within the former Burn Burial Area contains TCE and MC as well as some perchlorate that could leach to groundwater at concentrations exceeding the MCLs or PCLs. The leaching of contaminants from the unsaturated soil to groundwater is considered a complete transport pathway that will be addressed during the remedial action. Due to the shallow nature of impacted soil, the full extent will be readily determined during the RD phase. The estimated in-place volume is 416 yd^3. Further refinement of the extent will take place during the RD phase.
- Two soil areas beneath the UEP had concentrations of TCE and/or MC that exceed the groundwater protection-industrial MSCs. The leaching of contaminants from the unsaturated soil to groundwater is considered a complete transport pathway. The first area is in the vicinity of 18CPT21 and the second area is in the vicinity of 18CPT25. A conservative extent estimate is 280 ft by 110 ft and a thickness of approximately 10 ft. Thus the estimated in-place soil volume is 11,400 yd^3. These two areas may be considered for remediation in the future as a contingency remedy. Further refinement of the extent would take place during the contingency RD phase, if needed, particularly since an overlapping area where DNAPL exists will be remediated.

Groundwater

- A plume of dissolved perchlorate contamination that exceeds the cleanup level exists under the entire site in the Shallow Zone with additional significant plume areas outside the LHAAP-18/24 footprint. The extent of the contamination in the Shallow Zone is estimated at 67 acres. In the Wilcox Formation, two perchlorate plumes, one occupying the entire west and southwest half of the containment area and the other in the north corner of the containment area, are estimated at a combined 21 acres.
- A plume of dissolved MC contamination exceeding cleanup levels exists in the Shallow Zone and in the Wilcox Formation near the southern area of the UEP. To the west of the ACD, the Wilcox Formation plume has very low MC concentrations. The size of the MC plume in the Shallow Zone is approximately 7.3 acres, and 4.8 acres in the Wilcox Formation.
- A plume of dissolved TCE contamination exceeding the cleanup level exists in the Shallow Zone under the entire site with additional significant plume areas outside the LHAAP-18/24 footprint. The size of the TCE plume in the Shallow Zone is approximately 59 acres. The high

TCE concentrations in shallow groundwater coincide with the two areas of MC contamination: MW-2 south of the former UEP, and monitoring well 120 northwest of the former ACD. A Wilcox Formation dissolved TCE plume has an area of approximately 16.6 acres and covers a large portion of the containment area with the highest concentration found in MW-14 in the former ACD area.

- A plume of dissolved 1,4-dioxane exceeding the cleanup level exists in the Shallow Zone in the ACD area and another plume is present to the south, in the area around MW-7. The size of the 1,4-dioxane plumes in the Shallow Zone is approximately 2.7 acres. A Wilcox Formation dissolved 1,4-dioxane plume has an area of approximately 1.2 acres centered around MW-14 in the former ACD area.
- Isolated detections of metals in the Shallow Zone at concentrations exceeding the MCLs/PCLs occur across the site, but without the clear plume patterns exhibited by VOCs. The major metals in the Shallow Zone are arsenic, barium, and chromium. The other metals (cobalt and nickel) are not detected consistently. In the Wilcox Formation, sporadic detections of arsenic above the MCL/PCL were reported in three wells.
- The source of VOCs in residual DNAPL is estimated to be present in groundwater in the ACD area and southern area of the former UEP, respectively. The aerial extent of the UEP DNAPL extent is estimated at 35,500 square ft (ft^2) and the aerial extent of the ACD DNAPL extent is estimated at 5,000 ft^2. Although the DNAPL investigation in 2014 defined the extent of DNAPL in the vicinity of the ACD, given the high concentrations of TCE and MC in ICT-12-E (97,400 micrograms per liter [µg/L] and 173,000 µg/L in February 2013, respectively) and monitoring well 120 (24,500 µg/L in May 2013 for TCE), the ACD source area may be extended north from the ACD toward ICT-12E and monitoring well 120, increasing the area to be treated for DNAPL. Under this situation, the cost estimate for the DNAPL area in the vicinity of the ACD may become larger and will be considered during the RD phase.

Other than the limited unsaturated soil containing MC and TCE that could leach to groundwater at concentrations exceeding the MCLs, the mass of contaminants can be considered in three parts: 1) mass dissolved in groundwater, 2) mass adsorbed onto soil below the water table, and 3) mass in the form of DNAPL (TCE and MC) or soil contamination (perchlorate). The dissolved and adsorbed mass can be considered accessible mass, readily removed by groundwater extraction, although within the lower permeability zones, limitations of mass removal will reduce the removal rate of contaminants by groundwater extraction. The DNAPL can be considered source mass and is less readily removed.

2.6 Current and Future Land and Resource Uses

2.6.1 Current and Future Land Uses

LHAAP is located near the unincorporated community of Karnack, Texas. Karnack is a rural community with a population of 775 people. The incorporated community of Uncertain, Texas, population 205, is located to the northeast of LHAAP on the edge of Caddo Lake and is a resort area and an access point to Caddo Lake. The industries in the surrounding area consist of agriculture, timber, oil and natural gas production, and recreation.

LHAAP has been an industrial facility since 1942. Production activities and associated waste management activities continued until the facility was determined to be in excess of the U.S. Army's needs in 1997. The plant area has been relatively dormant since that time. LHAAP is surrounded by a fence (except on the border with Caddo Lake), and current security measures at the LHAAP preclude unlimited public access to areas within the fence. The fence now represents the National Wildlife Refuge boundary. Approved access for hunters is very limited.

The reasonably anticipated future use of LHAAP-18/24 is as part of a national wildlife refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. That MOA documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge and will be used to facilitate a future transfer of LHAAP-18/24. Presently the Caddo Lake National Wildlife Refuge occupies a little more than 7100 acres of the 8,416-acre former installation. In accordance with the National Wildlife Refuge System Administration Act of 1966 and its amendments (16 USC 668dd), the land will remain as a national wildlife refuge unless there is a change brought about by an act of Congress, or the land is part of an exchange authorized by the Secretary of the Interior.

2.6.2 Current and Future Surface Water Uses

Streams on LHAAP currently support wildlife and aquatic life. While humans may have limited access to some streams during annual hunts, there is no routine human use of streams on LHAAP. The streams do not carry adequate numbers and size of fish to support either sport or subsistence fishing. During the summer months, the streams cease flowing and/or dry up. When flowing, the streams flow into Caddo Lake, a large recreational area that covers 51 square miles and has a mean depth of 6 ft. The watershed of the lake encompasses approximately 2,700 square miles. It is used extensively for fishing and boating. Caddo Lake is a drinking water supply for multiple cities in Louisiana including Vivian, Oil City, Mooringsport, South Shore, Blanchard, Shreveport, and Bossier City.

The anticipated future uses of the streams and lake are the same as the current uses.

2.6.3 Current and Future Groundwater Uses

Groundwater in the aquifer (250 to 430 ft bgs) near LHAAP is currently used as a drinking water source. The drinking water aquifer should not be confused with the deep zone groundwater, which extends only to a depth of approximately 151 ft bgs. The deep zone groundwater and the drinking water aquifer are distinct from each other and there is no connectivity between the contaminated zone and the drinking water aquifer.

There are five active water supply wells near LHAAP that are completed in the drinking water aquifer (**Figure 2-2**). One well is located in and owned by Caddo Lake State Park. The well is completed to a depth of 315 ft bgs and has been in use since 1935. A second well owned by the Karnack Water Supply Corporation services the town of Karnack and is located approximately 0.3 miles northwest of town. This well is completed to approximately 430 ft bgs and has been in use since 1942. The Caddo Lake Water Supply Corporation has three wells located both north and northwest of LHAAP. These wells are identified as Caddo Lake Water Supply Corporation Wells 1, 2, and 3, and all are hydraulically upgradient of LHAAP (Jacobs, 2002). These wells are completed deeper than the deepest zone of contamination at LHAAP. Because of this and the large distance between these wells and LHAAP, water removal from these wells is not expected to affect groundwater flow at the site. In addition, there are several livestock and domestic wells located in the vicinity of LHAAP with depths averaging approximately 250 ft bgs.

Three water supply wells are located within the boundary of LHAAP itself. One well is located at the Fire Station; the second well is located approximately 0.35 miles southwest of the Fire Station. The third well is located north of the USFWS administration building for the Caddo Lake National Wildlife Refuge, near the main entrance to LHAAP. The distances from these water supply wells to LHAAP-18/24 are approximately 2.16 miles, 2.25 miles, and 2.78 miles, respectively (Figure 2-2). The three water supply wells were completed at a depth much greater than the zone of contamination described at LHAAP-18/24. None of these three wells are currently used for drinking water at LHAAP, although they may supply water for non-potable uses. Two additional wells previously supplied water to the installation, but these have been plugged and abandoned.

Although the anticipated future use of the facility as a wildlife refuge does not include the use of the groundwater at LHAAP-18/24 as a drinking water source, the State of Texas designates all groundwater as potential drinking water, unless otherwise classified, and consistent with 30 TAC 335.563(h)(1). To be conservative, a hypothetical industrial use scenario was evaluated for risk. The future industrial scenario for LHAAP assumes limited use of groundwater as a drinking water source.

2.7 Summary of Site Risks

The BHHRA and BERA estimate the risks posed by contaminants at the Site if no action were taken. These assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action.

2.7.1 Summary of Human Health Risk Assessment

This section is based on the conclusions presented in the *Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites* (Jacobs, 2002), and the *Installation-wide Baseline Ecological Risk Assessment* (BERA) (Shaw, 2007) and the BERA Addendum (AGEISS, 2014). The risk assessment was completed using data from samples collected through February 2001 for groundwater and through 1998 for soil. Additional soil samples were collected during the perchlorate investigation in 2002, for the installation-wide BERA, and the sump investigation in 2006. A Preliminary Site Investigation was also conducted in 2013, 2014 and 2016 and additional samples were collected during that investigation. In general, the additional soil sample results do not change the conclusion of the risk assessments that soil poses no unacceptable human health risks to the hypothetical site worker. The discussion of results and risks presented here are therefore as presented in the Baseline HHRA and FS. During the risk assessment, soil and groundwater data were used to calculate the aggregate risk, which was then compared to the USEPA target risk range of 1×10^{-4} to 1×10^{-6} for the excess lifetime carcinogenic risk and to a hazard index (HI) of 1 for non-carcinogenic hazards. If there is no unacceptable risk associated with a medium, and a cleanup level is not exceeded, then the medium is not identified in this ROD for remediation. The CSM that is associated with the risk assessment was introduced in **Section 2.5.1**, and is presented as **Figure 2-4**.

2.7.1.1 Identification of Chemicals of Potential Concern

The BHHRA identified chemicals of potential concern (COPCs) for LHAAP-18/24 and evaluated the carcinogenic risk and non-carcinogenic hazard for each. **Table 2-1** summarizes the risk assessment data for the COPCs, including minimum and maximum detected concentrations, frequency of detection, and exposure point concentrations (EPCs). Analytical results for various congeners of dioxins and furans are expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalence concentration (TEC).

2.7.1.2 Exposure Assessment

The Jacobs risk assessment (Jacobs, 2002) presented the human health risks and hazards to a hypothetical future maintenance worker under an industrial scenario for soil and groundwater.

For soil, reasonable exposure pathways according to the CSM are: incidental ingestion of the surface soil (0 to 2 ft bgs), dermal contact with the surface soil, inhalation of particulates, and inhalation of VOCs from the soil (0 to 7 ft bgs). For groundwater, reasonable exposure pathways are ingestion of groundwater, dermal contact while showering with contaminated groundwater, and inhalation of VOCs while showering with contaminated groundwater.

2.7.1.3 Toxicity Assessment

The carcinogenic and non-carcinogenic toxicity assessments from the BHHRA are summarized in **Tables 2-2** and **2-3**, respectively. The toxicity data assumes that exposure would be chronic to be conservative. Sources for the data include the Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEAST).

2.7.1.4 Risk Characterization

Characterization of the carcinogenic risk and non-carcinogenic hazard are summarized in **Tables 2-4** and **2-5**, respectively. For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime carcinogenic risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where:

where:	risk	=	unitless probability of an individual developing cancer
	CDI	=	chronic daily intake averaged over 70 years, expressed as milligrams per kilogram per day (mg/kg-day)
	SF	=	slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that usually are expressed in scientific notation. An excess lifetime carcinogenic risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime carcinogenic risk" because it would be in addition to the risks of cancer that individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three. USEPA's generally acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ < 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The HI is generated by adding the HQs for all COCs that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI < 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-carcinogenic HQ = CDI/RfD

Where: CDI = chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (e.g., chronic, subchronic, or short-term).

The carcinogenic risks and non-carcinogenic hazard for groundwater are unacceptable; both the carcinogenic risk and the non-carcinogenic hazard for soil are acceptable. The carcinogenic risks for groundwater and soil are 4.4×10^{-1} and $5.0x10^{-7}$ and, respectively (Jacobs, 2002). The carcinogenic risk for ground water exceeds the USEPA target risk range of 1×10^{-4} to 1×10^{-6}; the carcinogenic risk for soil is less than the risk range. The HIs for groundwater and soil are 3,200 and 0.042, respectively. The groundwater HI is above the acceptable HI of < 1 while the soil HI is less than 1. Chemicals with a risk greater than 1×10^{-4} in groundwater include TCE, and methylene chloride. Chemicals with a HQ greater than 1 in groundwater include chloroform, perchlorate, methylene chloride, TCE, antimony, manganese, and nickel. Methylene chloride, TCE, and perchlorate were the primary contributors to the HI in groundwater; with HQs of 1,600, 800, and 750, respectively.

The BHHRA included an uncertainty analysis which identified factors that would cause values used in the risk assessment to be over or underestimated. The analysis concluded that the risks and HIs are overestimated, making the BHHRA a conservative evaluation. Additionally, the uncertainty analysis indicated a portion of the non-carcinogenic effects associated with manganese in groundwater may be due to background.

2.7.1.5 Evaluation of COPCs

Tables 2-6 through **2-9** list the chemicals in Shallow Zone and Wilcox Formation groundwater that exceed those values for the carcinogenic risk and HQ, respectively. There is no carcinogenic risk or non-cancer hazard in soil to the hypothetical maintenance worker. These tables also summarize the justifications for which of the COPCs should be classified as COCs. COPCs in groundwater were identified as COCs when they posed a carcinogenic risk above the acceptable range (risk greater than 1×10^{-4}), when their HQ was greater than 1, or when the EPC was above the MCL or in the absence of federal drinking water standards, the Texas Risk Reduction Program (TRRP) Tier 1 Residential Groundwater Protective Concentration Level (PCL). Recent data obtained after the BHRRA investigation was used when possible. Based on the comparison of the maximum groundwater concentration since the BHHRA to their associated SDWA MCL or PCL, these COCs have been identified on **Table 2-10** to be of concern in the Shallow Zone and Wilcox Formation groundwater.

Although exposure to soil does not pose an unacceptable carcinogenic risk or non-cancer hazard, the concentrations of contaminants in soil could be an ongoing source of groundwater contamination. To assess this, the potential soil-to-groundwater pathway was evaluated for TCE, MC, PCE and perchlorate. The concentrations of these chemicals were compared to their TCEQ soil MSCs for industrial use based on groundwater protection (GWP-Ind MSC), which are more stringent than the soil MSCs for industrial use based on inhalation, ingestion, and dermal contact (TCEQ, 2006). The evaluation indicated that these contaminants could adversely impact groundwater, and the more stringent GWP-Ind MSC values are the proposed soil cleanup levels.

Table 2-10 presents the final list of COCs and all media, along with cleanup levels.

The human health risk assessment, which was based on the reasonably anticipated future use as a national wildlife refuge, does not address unrestricted use. In accordance with 30 TAC 335.566, a notification will be recorded in the Harrison County records stating that the Site is suitable for nonresidential use.

2.7.2 Summary of Ecological Risk Assessment

The BERA (Shaw, 2007a) and BERA Addendum (AGEISS, 2014) evaluated potential hazards to ecological resources at LHAAP by conducting a screening evaluation to identify initial COPECs in the individual sub-areas and watersheds. The potential of these COPECs to adversely affect communities was evaluated for: (1) organisms that have direct contact with the COPECs (e.g., plants and earthworms growing and living in contaminated soil); and (2) organisms that may be exposed to the chemicals via food chain pathways (e.g., ingestion of an earthworm living in the contaminated soil by a shrew). Potential impacts to invertebrate and plant communities were evaluated by comparing COPEC concentrations to benchmark values available from multiple literature sources. For the food chain exposure assessment, a number of measurement receptors were selected as representative species for the various trophic levels in the food web that could be at risk from contaminants in site media. The measurement receptors that were selected and used in the food chain evaluation included the following:

- Deer Mouse
- Raccoon
- Modified Raccoon (as a surrogate for the Louisiana Black Bear)
- Short-Tailed Shrew
- Red Fox
- Muskrat
- River Otter
- Townsend's Big-Eared Bat
- Common Snapping Turtle
- Bank Swallow
- American Woodcock
- Belted Kingfisher
- Red-Tailed Hawk

A food chain model was developed and used to estimate the total dose for each measurement receptor based on species-specific considerations such as diet, body weight, ingestion rates, etc., using conservative exposure estimates. Ecological hazard estimates were developed based on exposure to all media including soil in a particular sub-area and surface water and sediment from any watersheds present in the sub-areas. Two different soil depths were used for modeling exposure to ecological receptors: surface soil (0 to 0.5 ft) and total soil (0 to 3 ft). Each receptor was assumed to be exposed to one of the two depths based on its life history characteristics (e.g., burrowing animals were assumed to be exposed to total soil). Bioaccumulation of chemicals up the food chain was initially estimated using uptake factors obtained from available literature, and then refined using site-specific data obtained during the BERA.

Ecological effects quotients (EEQs) were developed for each of the measurement receptors. EEQs are similar to HQs for human health, and are calculated by dividing the total dose that the receptor is exposed to by the toxicity reference value (TRV), which is based on a no-observed adverse effect level (NOAEL) or the lowest-observed adverse effect level concentration. If the EEQ exceeds 1 for a receptor (based on the NOAEL TRV), then that chemical is considered to have a realistic potential to cause adverse ecological impacts, and is identified as a final COPEC that should be addressed either through remediation or further investigation. As discussed in the BERA, there are several important uncertainties associated with the assumptions used in the EEQ process, and it should be noted that EEQs greater than 1 do not necessarily mean that ecological impacts have occurred, or are occurring.

Several sub-areas were established within LHAAP for the BERA. LHAAP-18/24 falls within the Waste Sub-Area. The Installation-Wide BERA did not identify potential risk to ecological receptors at LHAAP-18/24 (Shaw, 2007b). Should there have been any ecological risk, it would have been expressed by this point in time. The BERA Addendum completed in 2014 (AGEISS, Inc., 2014) did not change the conclusion of the 2007 BERA.

2.7.3 Basis of Action

The remedial action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. Actions for the groundwater are necessary to address the potential for human health risks in the unlikely event there is an attempt to use groundwater as a potable water source.

Actions for soil are necessary to address human health risk including the pathway from soil to groundwater. **Table 2-10** presents the COCs and the final cleanup levels for both soil and groundwater, with groundwater COCs for the shallow zone and the Wilcox Formation listed separately.

2.8 Remedial Action Objectives

The RAOs for LHAAP-18/24 presented in this ROD for the selected remedy and contingency remedies address contamination associated with the media at the Site and take into account the future uses of LHAAP surface waters, land, and groundwater. The RAOs for groundwater are:

- Protection of human health by preventing human exposure to the groundwater contaminated with COCs,
- Protection of human health and the environment by preventing groundwater contaminated with COCs from migrating into nearby surface water,
- Return groundwater to its beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the Site (40 C.F.R. § 300.430(a)((1)(iii)(F)).

RAOs for soil are:

- Protection of human health and the environment by preventing the migration of contaminants to groundwater from potential sources in the soil.

The above RAOs recognize USEPA's policy to return all groundwater to beneficial uses, based on non-binding programmatic expectation in the NCP, and is consistent with the NCP regulations requiring the lead agency, the U.S. Army in this case, to establish RAOs specifying contaminants and media of concern, potential exposure pathways, and remediation goals.

Per these RAOs, and consistent with the NCP, groundwater will be returned to its beneficial use. In the absence of federal drinking water standards, the groundwater clean-up level at the Site is the TRRP Tier 1 Residential Groundwater PCL and is protective of human health and the environment.

2.9 Description of Alternatives

Six alternatives (including No Action) are proposed. This section introduces the remedy components, identifies the common elements and distinguishing features of each alternative, and describes the expected outcomes of each.

2.9.1 Description of Remedy Components

Alternative 1 – No Action

As required by the NCP, the no action alternative provides a comparative baseline against which the action alternatives can be evaluated. Under this alternative, groundwater would be left "as is" without implementing any additional monitoring, containment, removal, treatment, or other mitigating actions. No actions would be implemented to reduce existing or potential future exposure to human and ecological receptors, although NA would be ongoing.

Estimated Capital Present Worth Cost: $0
Estimated O&M Present Worth Cost: $0
Cost Estimate Duration: NA
Estimated Present Worth Cost: $0

Alternative 2 – Enhanced Groundwater Extraction and Ex-Situ Treatment, LUCs, EISB Inside and Outside the Containment Area and in the Wilcox Formation, Unsaturated Soil Excavation, and Off-Site Disposal

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within and outside the containment area.
- Replacement of the existing GWTP with a new GWTP with the contingency to treat for 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).

- Implementation of ISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three or more locations, and inside the containment at five or more locations.
- Implementation of groundwater extraction and removal of residual DNAPL in two distinct areas inside the containment area, as needed.
- Maintenance of existing cap over the UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year reviews.
- MNA with LTM semiannually for 3 years, annually until the next five-year review, then annually until recommended otherwise at the five-year review to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen. Monitoring will continue until five-year review demonstrate that cleanup levels are reached.
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met.

Estimated Capital Present Worth Cost: $10,600,000
Estimated O&M Present Worth Cost: $19,600,000
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $30,200,000

Alternative 3 – Groundwater Extraction and Treatment, Containment (slurry wall), MNA outside the containment and in Wilcox Formation, and LUCs

The major components of this alternative include the following:

- Continued use of a reduced groundwater extraction system for hydraulic control, as needed.
- Replacement of the existing GWTP with a new GWTP with the contingency to treat for 1,4-dioxane.
- Installation of a slurry wall for containment of groundwater.
- Improvements to the soil cover to promote drainage and reduce infiltration.
- Maintenance of existing cap over the former UEP.
- MNA for groundwater contamination within the Wilcox Formation and outside the slurry wall.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year reviews.
- MNA with LTM semiannually for 3 years, annually until the next five-year review, then annually until recommended otherwise at the five-year review to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen. Monitoring will continue until five-year review demonstrate that cleanup levels are reached
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met.

Estimated Capital Present Worth Cost: $6,410,000
Estimated O&M Present Worth Cost: $12,240,000
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $18,650,000

Alternative 4 - Enhanced Groundwater Extraction and Treatment, LUCs, EISB Inside & Outside Containment Area and in Wilcox Formation, Unsaturated Soil Excavation and Off-Site Disposal, and Surfactant Enhanced DNAPL Removal

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Replacement of the existing GWTP with a new GWTP with the option to treat for 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).
- Implementation of ISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three locations, and inside the containment at five locations.
- Implementation of surfactant flushing for removal of DNAPL in two distinct areas inside the containment area at the site.
- Maintenance of existing cap over the former UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year reviews.
- LTM semiannually for 3 years, annually until the next five-year review, then annually until recommended otherwise at the five-year review to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen. Monitoring will continue until five-year review demonstrate that cleanup levels are reached
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that

may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met.

Estimated Capital Present Worth Cost: $13,110,000
Estimated O&M Present Worth Cost: $19,390,000
Cost Estimate Duration: 30 years
Estimated Total Present Worth Cost: $32,500,000

Alternative 5 - Enhanced Groundwater Extraction and Treatment, LUCs, EISB Inside and Outside Containment Area and in Wilcox Formation, Unsaturated Soil Excavation and Off-Site Disposal, Thermal DNAPL Removal

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Replacement of the existing GWTP with a new GWTP with the option to treat for 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).
- Implementation of ISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three locations, and inside the containment at five locations.
- Implementation of thermal desorption and removal of DNAPL in two distinct areas inside the containment area at the site.
- Maintenance of existing cap over the former UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year reviews.
- LTM semiannually for 3 years, annually until the next five-year review, then annually until recommended otherwise at the five-year review to evaluate remedy performance and

determine if plume conditions remain constant, improve, or worsen. Monitoring will continue until five-year review demonstrate that cleanup levels are reached

- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met.

Estimated Capital Present Worth Cost: $19,520,000
Estimated O&M Present Worth Cost: $13,150,000
Cost Estimate Duration: 20 years
Estimated Total Present Worth Cost: $32,670,000

Alternative 6 - Enhanced Groundwater Extraction and Treatment, LUCs, EISB Inside and Outside Containment Area and in Wilcox Formation, Unsaturated Soil Excavation and Off-Site Disposal, Enhanced DNAPL Remediation using Zero-Valent Iron (ZVI)

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within the containment area or potentially a new GWTP including contingency use of advanced oxidation process for treatment of 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).
- Implementation of ISB of Shallow Zone groundwater outside the containment area at several locations, in the Wilcox Formation at three locations, and inside the containment at five locations.
- Implementation of ZVI (micron-scale) for in situ treatment of DNAPL in two distinct areas inside the containment area at the Site.
- Maintenance of existing cap over the former UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.

- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year reviews.
- LTM semiannually for 3 years, annually until the next five-year review, then annually until recommended otherwise at the five-year review to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen. Monitoring will continue until five-year review demonstrate that cleanup levels are reached
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-1**0) in groundwater are met.

Estimated Capital Present Worth Cost: $102,230,000
Estimated O&M Present Worth Cost: $19,390,000
Cost Estimate Duration: 30 years
Estimated Total Present Worth Cost: $121,620,000

2.9.2 Common Elements and Distinguishing Features

Common Elements of Alternatives 2 through 6

Common elements of Alternatives 2 through 6 are described below.

Maintenance of the existing cap over the former UEP – The cap would continue to be monitored, maintained, and repaired, as necessary, to ensure long-term effectiveness. This includes inspections of the cap to check for erosion, settlement, and deep-rooted vegetation, and implementation of necessary repairs. Routine maintenance and repair of the cap would include actions needed to ensure that the integrity of the cap is maintained (e.g., mowing, seeding, and settlement/erosion repair)

Operation of the existing GWTP and associated groundwater extraction system – The intensity and duration of continued use varies within the alternatives.

MNA to reduce and control COC concentrations in areas outside the direct influence of the containment area – MNA relies on natural biological, chemical, and physical processes to reduce the mass and concentrations of groundwater COCs under favorable conditions. MNA was evaluated and is a viable option for those areas but not as a primary remedy as additional evidence is needed for MNA to be used as a primary remedy. MNA for 1,4-dioxane has not been established at this time.

MNA sampling would be performed as part of groundwater monitoring plans. MNA sampling would be performed quarterly for the first two years, semiannually for the next three years, then annually until the next Five-Year Review. After that, the sampling frequency may be changed to once every five years if the data suggest less frequent sampling is appropriate. The analytical program would consist of VOCs, metals, perchlorate, and 1,4-dioxane. The following parameters would also be included in the initial analytical program: sulfate, nitrate, nitrites, alkalinity, TOC, and field tests for dissolved oxygen, redox potential, and ferrous iron. These parameters would be dropped when NA is well documented. Additional parameters that will be conducted for two events only in select Wilcox Formation wells (e.g., 18CPTMW01SW and 18CPTMW06SW for TCE and MC wells) to establish biodegradation potential include: reductive TCE and vinyl chloride (VC) gene expression, dehalococcoides and dehalobacter concentration, and compound specific isotope analysis for TCE. Subsequent LTM would be limited to VOCs, metals, and perchlorate.

Inspection and Long-Term Groundwater Monitoring – Alternatives 2 through 6 include inspection and LTM activities. Monitoring would be continued as required to evaluate the effectiveness of the remedy, to demonstrate compliance with applicable or relevant and appropriate requirements (ARARs) and RAOs, and to support five-year reviews

LUCs – LUCs would be implemented to support the RAOs. The LUC for groundwater would prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the sites for anything other than environmental monitoring and testing. The LUC to prohibit groundwater use (except for environmental testing and monitoring) as a potable source would remain until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; and to maintain the integrity of any current or future remedial or monitoring systems until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met. The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

In addition, within 90 days of signature of this ROD, the U.S. Army shall request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions based on a preliminary LUC boundary. Within 21 days of the issuance of the ROD, the U.S. Army will propose deadlines for completion of the RD Work Plan, RD, and Remedial Action Work Plan. The documents will be prepared and submitted to USEPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. The long-term groundwater and surface water monitoring and MNA performance monitoring will also be presented in the RD. Consistent with the dates presented for these documents, the U.S. Army shall: 1) request the Texas Department of Licensing and Regulation to notify well drillers of the final boundary of groundwater use prohibitions; and 2) notify the Harrison County Courthouse of the LUCs to include a map showing the areas of groundwater and nonresidential use restrictions, the monitoring system, and the surface impoundment cap at the Site, in accordance with 30 TAC 335.565.

The U.S. Army will implement, maintain, monitor, report on and enforce LUCs at U.S. Army-owned property. The U.S. Army shall perform those actions related to LUC activities described in this ROD and in the RD for the ROD. For portions of the Site subject to LUCs that are not owned by the U.S. Army, the U.S. Army will monitor and report on the implementation, maintenance, and enforcement of LUCs, and coordinate with federal, state, and local governments and owners and occupants of properties subject to LUCs. The U.S. Army will provide notice of the groundwater and soil (surface and subsurface) contamination and any LUCs referenced in the ROD. The U.S. Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and LUCs. The U.S. Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the RD for the ROD. The U.S. Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The U.S. Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of U.S. Army-owned property, the U.S. Army will provide written notice of the LUCs to the transferee of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the U.S. Army shall provide USEPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the U.S. Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the LUCs relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

To transfer this property (LHAAP-18/24), an Environmental Condition of Property (ECP) document would be prepared and the Environmental Protection Provision from the ECP would be attached to the letter of transfer. The ECP will include cap protection and maintenance, land use, groundwater use and monitoring system maintenance restrictions as part of the Environmental Protection Provisions. The property would be transferred subject to the LUCs identified in the ECP. These restrictions would prohibit or restrict property uses that may result in damage to the existing remedy (surface impoundment cap) or monitoring system or exposure to the contaminated groundwater (e.g., drilling restrictions) or soil (e.g. residential land use prohibition).

The U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUCs objective at the Site after it has been transferred.

Distinguishing Features of Alternatives 2, 4, 5, and 6

The distinguishing features of Alternative 2, 4, 5, and 6 compared to Alternative 3 are excavation and removal of contaminated soil, enhanced groundwater extraction, and EISB. The enhanced element of the groundwater extraction and treatment and EISB employed in Alternatives 2, 4, 5, and 6 are described below.

Enhanced Groundwater Extraction – Enhanced extraction involves the reactivation of ICTs. Review of flow rates and contaminant concentrations suggest that reactivating certain ICTs that were turned off could be very productive in removing contaminant mass from the subsurface if the extraction flow rate is sustainable. Two ICTs (ICT 3 and ICT 9) in particular have a high potential for removing a large amount of COC mass from the groundwater at least based on historical results. Sampling of the various inactive ICTs to determine which ICTs would be most effective will be conducted before determining which two ICTs will be activated.

EISB – The components of this action include: EISB would consist of the application of organic substrate (e.g., emulsified vegetable oil (EVO) or other formulations) as a bacterial food source, and a bacterial inoculation mix (e.g., SDC-9 or KB-1 Plus®), in areas of the groundwater plume outside the containment area within areas of high perchlorate and high TCE in the northeast, southwest, and southeast. Inside the containment, EISB would be conducted upgradient of MW-21 and 109 in the northeast boundary, near monitoring wells 120 and MW-14, and in the area of MW-23 and location 18CPT03 where high perchlorate concentrations were detected. EISB will also be applied near 18CPTMW08SW and 18CPTMW22SW into the Wilcox Formation due to the presence of high concentrations of perchlorate in the Wilcox Formation in this area of the Site. It is anticipated that EISB in the treated DNAPL areas will be implemented in a grid fashion with 25 by 25 ft spacing.

Excavation and Off-site Disposal of Contaminated Soil - Unsaturated soil exceeding the cleanup levels for soil listed in **Table 2-1**0 in two areas south of the UEP and two areas to the west of the UEP would be excavated and disposed off-site. The actual implementation of the soil excavation for the location beneath the UEP would be deferred to year 6 of remedy implementation at the earliest. The excavation and disposal activities for the other areas would be completed as part of the RA.

Distinguishing Feature of Alternative 2

The component of this action includes: Vertical extraction wells that will be placed inside the residual DNAPL areas and connected to the extraction manifold to the GWTP. The purpose of these extraction wells is to enhance removal of DNAPL. Free DNAPL, if present, will be removed by the gradient created by the extraction wells if present within the zone of influence. Additionally, a large portion of trapped DNAPL will be removed by enhanced dissolution as fresh groundwater is forced through the zone of influence of the wells.

Distinguishing Feature of Alternative 3

The distinguishing features of Alternative 3 compared to Alternatives 2, 4, 5, and 6 is the inclusion of a slurry wall for containment.

Slurry Wall Containment – The components of this action include: Construction of a slurry wall. A slurry wall is a continuous low permeability subsurface trench formed by mixing clay minerals (typically bentonite) with in situ soil to contain contaminated groundwater. It is constructed very much like an ICT with the exception that the intent is to prevent groundwater movement rather than encourage it. The slurry wall can be installed around the entire area of a shallow plume to effectively contain contaminated groundwater from lateral migration.

Distinguishing Feature of Alternative 4

This alternative is similar to Alternative 2, 5, and 6 with a specific means to enhance the removal of DNAPL from the shallow zone groundwater in the two DNAPL areas of the site. The application of surfactant flushing will accelerate removal of residual DNAPL, reduce remaining COC mass, and reduce the lifecycle of the project.

Surfactant Flushing – The components of this action include: Once a required treatability test to identify and optimize the concentrations of the most compatible surfactant(s)/electrolyte(s) mixture, and application volume to the site groundwater and soil is completed, a pilot-scale test is needed to better understand how well surfactant addition would be distributed in the subsurface and result in solubilization of DNAPL from both coarse and fine-grained soils (i.e., to understand limitations of distributing surfactant due to soil heterogeneity). This is an important step because the majority of the residual DNAPL was identified to occur in fine-grained soils (low permeability zones). Pilot-scale testing will also be used to determine whether DNAPL migration to unintended areas would occur and to determine means to prevent this potential loss of process control. If pilot-scale testing proved successful, remediation will be designed and conducted. It is expected, however, removal of residual DNAPL via surfactant flushing and extraction will not be complete, particularly due to the difficulty in surfactant distribution within the low permeability zones. Removal of up to 90% is plausible based on vendor information, although this has to be confirmed by pilot-scale testing.

Distinguishing Feature of Alternative 5

This alternative is similar to Alternative 4 however, instead of surfactant flushing, Alternative 5 utilizes In Situ Thermal Treatment through ERH to accelerate removal of residual DNAPL. There are various ISTD technologies that could be applicable to the site conditions; however, ERH was selected for costing purposes and discussions, and costs presented in the FS and this ROD are based on this ERH technology.

In Situ Thermal Treatment - ERH – The components of this action include: The application of electrical current through the subsurface, resulting in the generation of heat. ERH uses the natural electrical resistance within the subsurface where energy is dissipated through ohmic, or resistive, losses. This manner of in situ heating allows energy to be focused into a specific source zone. When the subsurface temperature is increased to the boiling point of the pore water or the saturated media in the treatment zone, steam is generated. The steam strips contaminants from the soils and enables them to be extracted from the subsurface. In addition, contaminants are directly volatilized from unsaturated soil. ERH is particularly suited to the treatment of lower permeability strata and to DNAPLs that have become consolidated within zones of low permeability with higher organic content. An ERH system consists of subsurface electrodes connected to direct current through the subsurface, and a vapor extraction system to capture the volatilized water and contaminants. Removal of residual DNAPL via thermal treatment and extraction will remove at least 99.9%. Thermal treatment also enhances mobilization of organic matter from the soil to groundwater, which will act to enhance biodegradation of the COCs. Note that while the focus of this discussion is on ERH, other thermal treatment technologies such as thermal conduction heating could be equally applicable.

Application of thermal treatment in the southern area of the UEP will also remove COCs in the unsaturated zone (e.g., area represented by 18CPT21) that would otherwise be subject to excavation. Therefore, the volume requiring excavation is reduced and would be estimated by approximately 6,000 yd^3.

Distinguishing Feature of Alternative 6

This alternative is similar to Alternative 5 however, instead of In Situ Thermal Treatment, Alternative 6 utilizes ZVI to accelerate removal of residual DNAPL.

ZVI Treatment – The components of this action include: Micron-scale ZVI will be injected into targeted zones using direct push tools and/or injection wells. The radius of influence of the injection point should be known to determine spacing of injection locations and allow overlap of radii of influence. For cost estimation, it is assumed that one injection point is conducted for every 100 ft^2 area (radius of influence of approximately 5.5 ft). The amount of ZVI should be such that excess quantities of iron is introduced to account for the mass of chlorinated VOCs but also for 'natural demand' to ascertain that sufficient residual remains in the formation to treat chlorinated VOCs associated with diffusion from fine-grained soils that would occur over time. A quantity of 0.01 lb/lb of micron-scale ZVI to formation soil is assumed based on treatability testing. Indication of distribution of ZVI can be determined using pH, ORP, and dissolved iron concentrations. Reapplication of ZVI might be required should conditions indicate absence of reducing conditions.

Injection of ZVI into DNAPL areas could have the unintended consequences of mobilizing DNAPL to unimpacted areas by virtue of creating a higher hydraulic head within the injection locations. This would be managed by minimizing the volume of fluid used to inject the ZVI, strategically placing the injection points starting at the perimeter of the area of impact and moving inward, and use of monitoring wells in the areas of injection particularly near the perimeter of the injection area to monitor CoC concentrations.

For cost estimating purposes, two applications of ZVI treatments are assumed with the second injection equal to 40% of the first injection due to mass and volume reduction associated with the first injection. Due to the difficulty in distributing the injected ZVI in low permeability zones, ZVI application is assumed to remove no more than 70% to 80% of the mass of VOCs per application.

2.9.3 Expected Outcomes of Each Alternative

Alternative 1 would allow the Site to remain a hazard to human and ecological receptors, since it simply leaves the Site as is. Alternatives 2, 4, 5, and 6 provide the same outcome to mitigate exposure to human and ecological receptors by excavation and off-site disposal of the contaminated unsaturated soil to eliminate the potential soil-to-groundwater pathway, preventing further degradation of groundwater from contaminated soil. Alternatives 4, 5, and 6 also would significantly and permanently reduce groundwater contaminant concentrations to the applicable cleanup levels through active treatment using EISB and other technologies, and, therefore, provide long-term effectiveness and permanence within shorter timeframes than Alternatives 2 and 3. Alternative 3 would contain the contaminated groundwater and rely on MNA to reduce contaminant levels over time. Attainment of groundwater cleanup levels would require several hundred years for Alternatives 2 and 3. Groundwater cleanup levels should be in 20 to 30+ years for Alternatives 4, 5, and 6. However, considering the lithologic variability, particularly the lateral and vertical change from sand to clay, the time to achieve the cleanup levels may vary by an order of magnitude. The similar outcomes are considered to be attainment of the SDWA MCLs to the extent practicable, and consistent with 40 C.F.R. §300.430(e)(2)(i)(B&C). If no SDWA MCL has been promulgated for a contaminant, the TRRP Tier 1 Residential Groundwater PCL is used in place of the SDWA MCL. In addition, the monitoring activities associated with MNA would confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply to the extent practicable, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. The LUC to prohibit groundwater use (except for environmental testing and monitoring) as a potable source until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; and to maintain the integrity of any current or future remedial or monitoring systems until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met. The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

2.10 Summary of Comparative Analysis

Nine criteria identified in the NCP §300.430(e)(9)(iii) are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. **Table 2-11** summarizes the comparative analysis of the alternatives.

2.10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or LUCs.

The six alternatives provide varying levels of human health protection. Alternative 1, no action, does not achieve the RAOs and provides the least protection of all the alternatives; it provides no reduction in risks to human health and the environment because no measures would be implemented to eliminate potential exposure pathways for human exposure to the groundwater contamination or potential migration of COCs from groundwater to surface water.

All five action alternatives protect human health and the environment. The action alternatives implement LUCs to prevent exposure to contaminated groundwater, and continue operation of the groundwater extraction and treatment system until monitoring data verifies that the contaminant plume originating within the containment area is stable and contained. Alternative 3, which relies the most heavily on containment and LUCs, does not provide the same degree of contaminant removal or treatment in groundwater as the other alternatives, but would be protective of human health because the LUCs would prevent human access to the contaminated groundwater. Alternative 3 does not prevent migration of COCs from groundwater outside containment to surface water and it does not prevent migration of COCs from soil sources in the unsaturated and saturated soil to groundwater. Alternatives 2, 4, 5, and 6 provide a similar level of overall protection and can eventually achieve the cleanup levels for the groundwater COCs due to active remediation and continued operation of the groundwater treatment system for contaminant removal; however, the duration to achieve the cleanup levels vary. Furthermore, the LUC for groundwater would protect human health by preventing access to the contaminated groundwater until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soils and groundwater allow for unlimited use and unrestricted exposure.

2.10.2 Compliance with ARARs

Section 121(d) of CERCLA and 40 C.F.R. §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as “ARARs”, unless such ARARs are waived under CERCLA Section 121(d)(4). The ARARs that pertain to this ROD are discussed in **Section 2.13.2**.

Because contaminated groundwater has the potential to flow into Harrison Bayou which flows to Caddo Lake, a drinking water supply, chemical-specific ARARs for surface water consumption are appropriate and relevant. Specifically, Texas surface water quality standards are set forth in 30 TAC 307.6(d)(1) for TCE (5 μg/L), 1,2-DCA (5 μg/L), 1,1-DCE (7 μg/L), and VC (2 μg/L) for LHAAP-18/24. These standards are equivalent to the MCLs. In the absence of a federal drinking water standard, the perchlorate clean-up level will be based on TRRP Tier 1 Groundwater Residential PCL.

Alternative 1 does not comply with chemical-specific ARARs for groundwater, unsaturated soils, or secondary source within the saturated soil because no remedial measures would be implemented.

Alternative 3 is not expected to return groundwater concentrations within the slurry wall to less than the cleanup levels, so it does not meet the return to beneficial use RAO within the slurry wall. Alternative 3 will require an ARAR waiver for the groundwater within the slurry wall.

Alternatives 2, 4, 5, and 6 comply with the chemical-specific ARARs for groundwater, unsaturated soil, and secondary groundwater source (residual DNAPL) because they prevent exposure to groundwater that exceeds ARARs and would eventually return groundwater and soil concentrations to less than cleanup levels and return the groundwater in the shallow zone and Wilcox Formation to the potential beneficial use as drinking water wherever practicable.

All of the action alternatives would comply with the action-specific ARARs and any non-ARAR considerations.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation, and the adequacy and reliability of controls.

Alternative 1 would be the least effective and permanent in the long term because no contaminant removal or treatment would take place and no measures would be implemented to control exposure to risks posed by contaminated groundwater or the potential for contaminated groundwater to migrate to Harrison Bayou.

Alternative 2 offers a moderate degree of long-term effectiveness through operation of an enhanced groundwater extraction and treatment system, combined with unsaturated soil removal, residual DNAPL source removal, and LUCs implementation, which would minimize the potential risk posed by the contaminated groundwater. Reduction of the residual DNAPL source with groundwater extraction is not highly effective and therefore, the magnitude of residual risk will remain unacceptable.

Alternative 3 offers a degree of long-term effectiveness through physical containment of contaminated groundwater using a slurry wall and gradient control by pumping, combined with MNA to monitor effectiveness and LUCs to prevent groundwater use. Alternative 3 is designed to contain contaminated groundwater in place in perpetuity and would require a waiver of the restoration RAO prior to implementation. This alternative is effective in containing the contaminants but not practical as operation of the GWTP will have to occur in perpetuity.

Alternative 4 offers a higher degree of long-term effectiveness compared to Alternatives 2 and 3 through surfactant flushing of residual DNAPL, ISB of groundwater inside and outside the containment and in the Wilcox Formation including as a polishing step for the residual DNAPL areas in the shallow zone, unsaturated soil excavation, enhanced groundwater extraction and treatment system, and LUCs implementation. Alternative 4 is likely to achieve groundwater cleanup levels in a shorter period of time than Alternative 2. However, the period of time remains long because the effectiveness of surfactant flushing of residual DNAPL in low permeability zones is uncertain due to the difficulty in reaching into the low permeability zones.

Alternative 5 offers the highest degree of long-term effectiveness through thermal remediation of VOCs in residual DNAPL saturated soil areas in groundwater, ISB of groundwater inside and outside the containment and in the Wilcox Formation including as a polishing step for the residual DNAPL areas in the shallow zone, unsaturated soil excavation, enhanced groundwater extraction and treatment system, and LUCs implementation. Alternative 5 will achieve groundwater cleanup levels in a shorter period of time than Alternatives 3 or 4 because 99.9% removal of VOCs from the residual DNAPL areas is possible.

Alternative 6 also offers a high degree of long-term effectiveness through application of ZVI to the residual DNAPL saturated soil areas, ISB of groundwater inside and outside the containment and in the Wilcox Formation including as a polishing step for the residual DNAPL areas in the shallow zone, unsaturated soil excavation, enhanced groundwater extraction and treatment, and LUCs implementation. Alternative 6 relies on effective distribution of injected ZVI to all impacted areas. However, the ability to distribute injected ZVI into low permeability zones with high residual DNAPL may not be effective, and achieving results comparable to the treatability study results of greater than 99% reduction of TCE and high percentage reduction of MC and perchlorate is unlikely.

Alternative 5 is expected to have the shortest duration to shutdown of the GWTP. Alternatives 4 and 6, while rapidly addressing COCs in residual DNAPL areas, suffer from the difficulty of distributing the injected material to low permeability zones and may not be as effective as would be expected from a treatability test results where contact between the contaminants and the material is not limiting. Alternative 2 will not achieve the RAOs within an acceptable period of time (e.g., within 30 years). Alternative 3 would not reach cleanup levels within the slurry wall, and, due to the risk of containment failure, would be the least permanent remedy.

2.10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 1 does not employ treatment in groundwater and would not result in a reduction of toxicity, mobility, or volume of contaminants. All of the action alternatives provide some degree of reduction of toxicity, mobility or volume through treatment.

Alternative 2 provides a reduction in toxicity, mobility and volume via continued operation of an enhanced groundwater extraction and treatment system but the rate of reduction expected within the residual DNAPL areas will be slow.

Alternative 3 provides mobility reduction through the installation of a slurry wall and continued hydraulic control as needed. Reduction of volume through treatment is limited to NA mechanisms of contaminants outside the slurry wall and ex situ treatment of extracted groundwater from within the containment area.

Alternative 4 provides faster permanent reduction in toxicity and volume of the groundwater contaminants than Alternatives 2, and 3. This is achieved through surfactant flushing of saturated source soil to remove DNAPL that may serve as a long-term source of groundwater contamination, excavation of unsaturated soil, and implementation of ISB in areas inside and outside the containment and within the Wilcox Formation. In addition to enhanced groundwater extraction, all the above technologies will result in a reduction in contaminant toxicity, mobility, and volume. However, reduction of mass of residual DNAPL via surfactant flushing is expected to be partial due to difficulty of surfactants to reach low permeability zones. NA mechanisms of contamination outside the containment area will continue to act to reduce contaminant mass.

Alternative 5 provides the greatest reduction in toxicity, mobility, and volume of the groundwater contaminants compared to the other alternatives. This is achieved through thermal treatment of saturated source soil to treat DNAPL that may serve as a long-term source of groundwater contamination, excavation of unsaturated soil, and implementation of ISB in areas inside and outside the containment and within the Wilcox Formation. In addition to enhanced groundwater extraction, this technology will result in a reduction in contaminant toxicity, mobility, and volume. NA mechanisms of contamination outside the containment area will continue to act to reduce contaminant mass.

Alternative 6 provides a high level of reduction in toxicity, mobility, and volume of the groundwater contaminants compared to the other alternatives but is expected to be less than that achieved by Alternative 5. Reduction of mass of residual DNAPL via ZVI injection is expected to be partial due to difficulty of ZVI to effectively reach low permeability zones. Excavation of unsaturated soil and implementation of ISB in areas inside and outside the containment and within the Wilcox Formation, in addition to enhanced groundwater extraction will result in a reduction in contaminant toxicity, mobility, and volume. NA mechanisms of contamination outside the containment area will continue to act to reduce contaminant mass.

Biological activity would generate daughter products that may temporarily increase toxicity or mobility of the contaminant plumes. Alternatives 3, 4, 5, and 6 include monitoring so that daughter products would be quantified, documented, and evaluated. The same biological activities would also consume the daughter products, and it is anticipated that these concentrations would be reduced to levels below their associated cleanup levels to return groundwater to its potential beneficial use, wherever practicable.

2.10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Because Alternative 1 does not involve remedial measures, no short-term risk to workers, the community, or the environment would exist.

All of the action alternatives involve potential short-term risks to workers associated with exposure to contaminated groundwater, vapor (i.e., volatilized and extracted VOCs), from monitoring and/or operation of drilling/construction equipment.

Alternative 2 presents risks associated with drilling new extraction wells, trenching for placement of conduits, and potential exposure to contaminated groundwater or heavy equipment. Alternative 2 presents potential risks associated with soil excavation (particulate emissions, heavy equipment) and off-site disposal which represents a greater exposure potential to LHAAP-18/24 workers, a greater potential for runoff releases to the environment and the potential for off-site traffic accidents and impacts on communities between LHAAP and the disposal facility. Risks are also associated with handling of chemicals used for ISB, although these chemicals are typically food grade and not harmful. Use of application equipment can also present risk.

Alternative 3 involves risks associated with the heavier equipment used in slurry wall construction and with handling the bentonite slurry used in construction. Alternative 4 requires a large construction footprint and will result in disturbing a wide area along the path of construction which will have an impact on the environment. Control of run-on and run-off would be critical to prevent cross-contamination of surface water. Risks associated with subsurface utilities are another concern of slurry wall installation.

Alternative 4 involves the same risks as Alternative 2 with the additional risks associated with surfactant flushing implementation which includes potential exposure to the surfactant and extracted fluids from the subsurface which would require surface handling, storage, treatment, and disposal.

Alternative 5 presents similar risks like Alternative 2 but has additional risks associated with implementation of thermal treatment technology which requires use of high voltage equipment and results in volatilization of VOCs that requires treatment at the ground surface.

Alternative 6 presents risks similar to Alternative 2 but with additional risk associated with use and handling of ZVI.

Alternatives 2 through 5 include the LUCs as elements of their remedies and would provide almost immediate protection from the contaminated groundwater by prohibiting groundwater use except for environmental monitoring and testing through LUC implementation through a relatively quick implementation period.

By planning the construction, excavation, and transportation activities in accordance with industry and occupational safety and health administration (OSHA) codes and requirements, risks from contaminant exposure and construction operations would be controlled to acceptable levels. Dust control and sediment deposition into adjacent surface water bodies can be controlled during earthwork and construction activities. Erosion control measures would include surface grading; emplacement of silt fences; covering surfaces with straw, mulch, riprap, and/or geotextile fabrics. Following completion of all construction and excavation, disturbed areas would be regraded with clean backfill and revegetated with native grasses. Appropriate personal protective equipment (PPE) would be required for remediation workers. Overall risk can be mitigated by developing a health and safety plan in compliance with OSHA requirements, communicating the hazards to involved parties, and providing the know-how and tools to mitigate those hazards.

2.10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternative 1, No Action, would involve shutting down the groundwater extraction system, which is assumed to be administratively unacceptable to the U.S. Army and to the regulatory agencies.

The action alternatives for groundwater are all technically implementable with varying degrees of difficulty.

Reactivation of existing ICTs for Alternatives 2, 4, 5, and 6 should be easy to implement as the tools and skilled resources are available. Similarly, implementation of additional extraction points for Alternative 2 should not pose any difficulties to drill the wells and connect the wells to the GWTP. ISB is specified for Alternatives 2, 4, 5, and 6. ISB has been implemented at other LHAAP sites and should not pose any difficulties to implement at LHAAP-18/24. Success of ISB was determined by conducting treatability testing and bioaugmentation at the laboratory scale. Treatability testing at the bench-scale and pilot-scale will also be required for surfactant remediation to select and optimize surfactant dose and provide proof of concept for Alternative 4 (i.e., loss of control for DNAPL migration, generation of adverse chemicals, and penetration effectiveness in low permeability zones). Thermal treatment (Alternative 5) does not require treatability testing and its implementability hinges on the availability of power to supply the electrodes with sufficient power to heat the saturated soils. Considering that power reliability has been a concern at the GWTP, this would be an important design consideration for this technology. Implementation of ZVI for Alternative 6 faces similar implementability considerations such as ISB implementation.

Alternative 3 has two significant implementation issues:

- The slurry wall would need to key into the confining layer for the shallow zone.
- Any significant discontinuities in the confining layer would need to be addressed.

There are areas at LHAAP-18/24 where both issues exist. Technologies are available to address both issues, but it will be difficult to ensure the quality of containment throughout the system.

For Alternative 2, 4, 5, and 6 soil excavation would also require coordination between excavation, sampling, transportation and disposal. However, because the volumes are not large, resources are readily available to implement.

2.10.7 Cost

Cost estimates are used in the CERCLA process to eliminate those remedial alternatives that are significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health or the environment. The cost estimates developed are preliminary estimates with an intended accuracy range of –30 to +50 percent. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

The costs include both capital costs (including fixed-price remedial construction) and long-term O&M costs (post-remediation). Overall 30-year present value costs are developed for each alternative assuming a discount rate of 3.0 percent. Total present value costs for each alternative are presented in Appendix D of the FS and a summary is presented below. It should be noted that some alternatives have extensive capital costs but could result in a serious reduction in the alternative lifecycle to achieve the RAOs (e.g., less than 30 years). Other alternatives that do not rely on intensive upfront remediation technologies have a very long remediation lifecycle (i.e., well beyond 30 years) that would outweigh the alternatives with high capital cost. Because cost determination was limited to 30 years per CERCLA requirements, the alternatives with high capital costs (e.g., Alternatives 5 and 6) appear to be as or more expensive on a 30-year basis than alternatives with low capital costs but long lifecycle duration (e.g., Alternatives 2 and 3).

The progression of total present value costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1, Alternative 3, Alternative 2, Alternative 4, Alternative 5, and Alternative 6. There are no costs associated with Alternative 1 because no remedial activities would be conducted. Alternative 6 has highest capital costs due to the high cost of ZVI, but lower O&M costs than all other alternatives with the exception of Alternatives 3 and 5. Alternative 5 has an O&M cost over 20 years after which the GWTP and extraction would be shut down. Alternative 5 has a higher capital cost associated with thermal treatment compared to Alternatives 2, 3, and 4. Alternatives 2, 3, and 4 have the lowest capital costs of the active remedial alternatives, with Alternative 3 having the lowest capital cost associated with slurry wall construction and lowest O&M cost due to the greater cost reductions in O&M associated with reduction in GWTP operation and reduction in monitoring costs (this alternative does not require full extraction of groundwater). Alternatives 2, 4, and 6 have the highest O&M costs of all the alternatives because it is assumed that GWTP operations will continue for 30 years with no reduction in extraction rates.

2.10.8 State/Support Agency Acceptance

The USEPA and TCEQ have reviewed the PP, which presented Alternative 5 as the preferred alternative. Comments received from the USEPA and TCEQ during the Proposed Plan development have been incorporated. Both agencies concur with the selected remedial action.

2.10.9 Community Acceptance

Community acceptance is an important consideration in the final evaluation of the selected remedy. Comments were received during the 30-day public comment period held for the PP from April 2, 2019 to May 2, 2019, and verbal comments were received during the public meeting held on April 25, 2019.

Comment responses were provided and are summarized in the Responsiveness Summary (**Section 3.0**).

2.11 Principal Threat Waste

Laboratory results from the groundwater at LHAAP-18/24 have indicated that possible “pools” of DNAPL may be residing as residual source material in fractures and pores in the subsurface. As a component of this groundwater, the hazardous contaminants, TCE and MC, are characterized as a highly toxic source material and, thus, a principal threat waste. In accordance with the NCP, treatment alternatives have been evaluated through the remedy selection process. The preferred remedial alternative includes an active remedial component that would mitigate the potential principal threat. By instituting an ISTD treatment of the groundwater, this active treatment would be applied to the two identified areas of DNAPL in the groundwater and would comply with the NCP expectations regarding treatment of affected media where principal threat may be considered.

2.12 The Selected Remedy

2.12.1 Summary of Rationale for the Selected Remedy

Alternative 5 – Enhanced groundwater extraction and treatment as needed, LUCs, EISB inside and outside containment area and in Wilcox Formation, unsaturated soil excavation, and thermal DNAPL removal is the preferred alternative for LHAAP-18/24 and is consistent with the intended future use of the site as a national wildlife refuge. The ISTD will rapidly reduce TCE and MC concentrations at two locations within the containment area to make conditions more amenable for EISB and/or MNA. The selected alternative offers a high degree of long-term effectiveness and can be easily and immediately implemented. This alternative is expected to achieve site RAOs in the shortest period of time compared to the other alternatives.

This alternative would satisfy the RAOs for the Site through the following:

- Continued use of the existing groundwater extraction system as needed with enhancements (including a potentially phased reactivation of two existing ICTs (ICT 3 and 9) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Continued operation of the current or potentially a new GWTP, including contingency use of advanced oxidation process for treatment of 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind) will result in the removal of soil that is a potential source of TCE and MC contamination to groundwater. The locations south of the former UEP, west of the UEP, and underneath the UEP have concentrations of residual contamination that pose a low-level threat to groundwater. The potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway. With the removal of this soil, the potential migration of TCE and MC from soil to groundwater would be eliminated and long-term operations/management for impacted soil would not be required
- Implementation of EISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three or more locations, and inside the containment at five or more locations or as needed to reduce to levels amenable to MNA.
- Implementation of ISTD to remove DNAPL that poses a principal threat to groundwater in two distinct areas inside the containment area at the site to reduce to levels amenable to MNA.
- MNA for both shallow zone and Wilcox Formation groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas (after evaluation of EISB) to reduce contaminant levels to cleanup levels and confirm the contaminated groundwater remains localized with minimal migration.
- Maintenance of the existing cap over the former UEP to reduce infiltration.
- The LUC to prohibit groundwater use (except for environmental testing and monitoring) as a potable source will be implemented to ensure protection of human health by preventing

exposure to groundwater until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met. The LUC restricting land use to nonresidential will be implemented until it is demonstrated that the surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure. The LUC to maintain the integrity of any current or future remedial or monitoring systems will be implemented until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met. The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

- Long-term monitoring and reporting would continue until the cleanup levels are achieved in groundwater to confirm protection of human health by preventing exposure to groundwater until cleanup levels are met.

Five-Year Reviews will be performed to document that the remedy remains protective of human health and the environment. If necessary, after the five year review, the Army, EPA, and TCEQ will assess the successfulness of the groundwater remedy. At that time, the FFA parties will determine if the activation of a contingency remedy is appropriate.

Based on information currently available, the U.S. Army believes the selected alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the CERCLA §121(b) criteria used to evaluate remedial alternatives. The selected alternative: 1) is protective of human health and the environment; 2) complies with ARARs; 3) is cost-effective; 4) utilizes a permanent solution; and 5) utilizes an active treatment as a principal element. The selected remedy addresses the statutory preference for treatment to the maximum extent possible. The high concentrations of TCE and MC in the shallow zone and Wilcox Formation indicate that residual DNAPL material may be acting as a principal threat waste. Therefore, the presence of residual DNAPLs in groundwater near the UEP and the ACD are considered sources of groundwater contamination that will be addressed during the remedial action. In accordance with the NCP, treatment alternatives have been evaluated through the remedy selection process. The preferred remedial alternative includes an active remedial component that would mitigate the potential principal threat. By instituting ISTD treatment of the groundwater, this active treatment would be applied to the highest concentration area in the TCE and MC groundwater plume and would comply with NCP expectations regarding treatment of affected media where principal threat may be considered.

Unsaturated soil known to contain residual contamination posing a low-level threat to groundwater is isolated to locations south of the former UEP, west of the UEP, and underneath the UEP. The potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway that will be addressed during the remedial phase.

In the RD, the U.S. Army will present details of the soil excavation, selected ISTD process (ERH or TCH), ISTD design, LUC O&M, groundwater monitoring, EISB implementation, GWTP operation and modifications, and MNA remedy implementation for LHAAP-18/24.

2.12.2 Description of the Selected Remedy

The selected remedy, Alternative 5, was outlined in **Section 2.9**; that description is expanded in the following discussion. The assumptions and specifications presented for the remedy were used for cost estimating purposes and are subject to change in the remedial design process. The major components of the remedy include:

Continued use of the existing groundwater extraction system with enhancements, as needed. The use of the existing groundwater extraction system will continue where extraction will not interfere with in situ remedies and where needed to control the plume during in situ treatment. The extraction plan detailing which ICTs will be operational during each phase of remedy implementation will be further developed during the remedial design phase. The groundwater extraction system would continue to operate with additional ICTs inside the containment area brought back on line (i.e., modifications implemented as part of the pilot study implemented in 2008 (Shaw) will be partially reversed), or potentially a new GWTP replacing the existing GWTP would be designed and used to treat extracted groundwater.

Preliminary results from the pilot study indicate that certain ICTs that were turned off could be very productive in removing contaminant mass from the subsurface if the extraction flow rate is sustainable. Based on historical results, two ICTs (ICT 3 and ICT 9) in particular have a high potential for removing a large amount of COC mass from the groundwater. Sampling of the various inactive ICTs to determine which ICTs would be most effective will be conducted before determining which two ICTs will be activated. The criteria for evaluating the ICT sample results and basis for recommending ICTs to be reactivated will be developed and presented in the RD. Groundwater extraction acts to remove source mass and contain the contamination within the shallow zone only. **Figure 2-16** shows the location of the ICTs, extraction wells, and pipelines that convey the extracted groundwater to the GWTP.

Continued operation of the current or potentially a new GWTP, including contingency use of advanced oxidation process for treatment of 1,4-dioxane. The existing groundwater extraction system currently removes water from 21 interception trenches and two vertical extraction wells (EW-1 and 18WW17). This groundwater extraction hydraulically controls migration of contaminants. The extracted groundwater is pumped to the GWTP, stored in an equalization tank for batch treatment, sent through precipitation to remove metals, subjected to air stripping to remove VOCs, and treated in a biological reactor to remove perchlorate. The treated effluent is discharged to Harrison Bayou or the INF Pond or released to Burning Ground No. 3 via a sprinkler system. Five other interception trenches that were previously used to extract groundwater (ICT-1, ICT-3, ICT-5, ICT-10, and ICT-12A) were deactivated on February 18, 2008 as part of a pilot test to encourage subsurface flow across the most contaminated portions of LHAAP-18/24. On December 5, 2012, ICT-12A was restored and is currently extracting groundwater.

Based on the estimates for the timeframe that will be required to remove the mass of contaminants within the containment area, it is expected that the GWTP will be operated for a minimum of 20 years. The current GWTP is nearly 17 years old and is aging, requiring frequent maintenance with anticipated more maintenance requirements with recapitalization for major item replacement in the near future. Additionally, the existing GWTP is oversized with a design capacity of up to 300 gallons per minute (gpm) while current operations recover an average flow of 20 gpm. Due to the age of the plant, frequent maintenance requirements, and idling conditions, Alternative 5 includes the potential for capitalization of a smaller foot print GWTP to replace the existing plant. The specific design and capacity of a new GWTP would be determined based on current and projected extraction rates and volumes.

The continued operation of the current GWTP or potentially a new GWTP will be determined through a cost/benefit analysis conducted during the remedial design phase. If the new GWTP is selected, the new GWTP will be designed for a 50 gpm flow rate, which should accommodate the anticipated increase in groundwater extraction rates (reactivation of two ICTs and additional extraction wells in the DNAPL areas in addition to any extraction from LHAAP-17 that could go on line for a duration of 18 months). The system will consist of the same processes of metals precipitation, VOC stripper, and fluidized bed reactor (FBR) for removal of perchlorate. Should treatment for 1,4-dioxane be required, an advanced oxidation process using the HiPOx™ technology consisting of hydrogen peroxide with ozone will be implemented as a contingency remedy. The determination about whether 1.4-dioxane treatment is required will be made as part of the remedial design.

Soil Excavation. Soil at two locations to the south of the former UEP (**Figure 2-16**) identified by TCE and MC exceedances between the depths of 8 and 12 ft bgs and depths of 5.5 and 12 ft bgs will be excavated. Additionally, soil in the former burn pit area to the west of the former UEP at depths ranging from 4 to 14 ft bgs will be excavated. The soil will be removed to meet the cleanup levels presented in **Table 2-10**. The shallow soil will be removed and stockpiled for use as backfill if clean. However, the backfill soil will be characterized before reuse. Excavation side walls and bottom will be sampled to confirm clean soil before backfilling with clean soil. Additional excavation will be conducted if contaminants are detected in the excavation walls or bottom. The contaminated soil will be stockpiled, sampled for characterization, and then hauled off-site for disposal at either a RCRA Subtitle C or Subtitle D landfill depending on soil characteristics. The in-place volume is estimated at 1,350 yd^3.

A contingency remedy to excavate soil beneath the UEP. If during the Five-Year Review the results of the groundwater remedy indicate a continuing source from the UEP, a contingency remedy to excavate soil beneath the UEP would be developed if COCs are present at concentrations exceeding the GWP-Ind. Criteria to be used to determine whether the contingency remedy should be implemented, as well as development and specific description of the contingency remedy would be presented in a RD/RAWP.

Implementation of EISB of shallow zone groundwater inside and outside the containment area and in the Wilcox Formation. EISB is planned in locations shown on **Figure 2-17** and where needed as a polishing step in thermal treatment areas. Final selection of the areas that will receive EISB will be developed during the remedial design phase. The locations on **Figure 2-17** are presented for costing purposes. ISB would consist of the application of organic substrate (e.g., EVO or other formulations) as a bacterial food source, and a bacterial inoculation mix (e.g., SDC-9 or KB-1 Plus®), in areas of the groundwater plume outside the containment area within areas of high perchlorate and high TCE in the northeast, southwest, and southeast. Inside the containment, ISB would be conducted upgradient of MW-21 and 109 in the northeast boundary, near monitoring wells 120 and MW-14, and in the area of MW-23 and location 18CPT03 where high perchlorate concentrations were detected. Enhanced bioremediation will also be applied near 18CPTMW08SW and 18CPTMW22SW into the Wilcox Formation due to the presence of high concentrations of perchlorate in the Wilcox Formation in this area of the Site. **Figure 2-17** shows the area targeted for ISB treatment based on existing information.

ISB would be applied using direct push technology (DPT) injections. Injection via deep boreholes that are surface cased may be required for the Wilcox Formation. Tracer tests will be conducted to determine whether the proposed injection locations are within or outside the capture zone of the extraction system with the goal to prevent injected substrate from being pulled into the extraction ICTs. Additionally, in order to minimize loss of ISB amendments, extraction wells would be temporarily shut down when ISB treatment amendment begins to appear in the wells. If ISB amendments reached extraction sumps this may result in biofouling problems that subsequently lead to groundwater extraction complications. Therefore, nearby ICTs and monitoring wells will be monitored for the occurrence of treatment amendments during implementation of enhanced ISB.

ISB will enhance biodegradation of perchlorate in situ that would ultimately reduce the concentration of perchlorate and VOCs to a level that would allow NA to take over and reduce concentrations to below the cleanup levels.

ISB amendments that result in creating geochemical changes (reducing conditions) favorable for anaerobic biodegradation could also have the potential to result in mobilization of arsenic to groundwater. Under anaerobic reducing conditions, immobilized ferric iron becomes reduced and mobile in the form of ferrous iron. Arsenic generally co-precipitates with ferric iron and as the iron is solubilized in the form of ferrous iron, arsenic tends to come off the soil matrix into solution. Therefore, monitoring for arsenic in groundwater will be an integral part of this process.

ISB will enhance biodegradation of MC, TCE, and perchlorate in situ and ultimately reduce the concentrations of those chemicals to a level that would allow NA to take over and reduce contaminant levels to below the cleanup levels. **Figure 2-17** shows the multiple areas targeted for ISB treatment based on existing information.

For cost estimating purposes, the ISB is assumed to be implemented using a biobarrier injection configuration. The spacing of injection points is assumed to be 20 ft. For the purposes of costing, five ISB biobarriers are assumed one in the northeast (900 ft), one in the southwest (600 ft), two 300-foot biobarriers in the northwest in the vicinity of 18CPTMW23 and 18CPTMW15 and AWD-4, 150 ft ISB in the vicinity of monitoring well 120, and one in the south (200 ft) for a total length of 2,450 ft and 122 DPT injection points. For the two grid areas, each grid is 200 ft by 200 ft in area and the injection points are 25 ft apart for a total of 81 injection points in each grid. In the Wilcox aquifer, the ISB is assumed to use a biobarrier injection in two rows each 100 ft long and 50 ft apart. Injection would occur upgradient of 18CPTMW08SW based on the potentiometric surface for the Wilcox Formation in this area of the Site. Another 200 ft ISB is assumed in the vicinity of 18CPTMW22SW and 150 ft ISB for MW-14. The ISB biobarrier and grid layout will be determined during the remedial design.

Two applications of ISB treatment are assumed for costing purposes. The first application will be DPT injection of a slow releasing organic substrate (EVO) during year 1 in the areas depicted on **Figure 2-17** Bioaugmentation is anticipated to be conducted 3 months after establishment of sustainable anaerobic conditions. It is assumed the first injection will reduce perchlorate concentrations by 90% and TCE and MC concentrations by 75%. The second application will be DPT injections of EVO and bioaugmentation during year 3 in the same areas. It is assumed the second injection will reduce perchlorate by 90% and TCE and MC by an additional 75%. After the first 2 injections, it is assumed that MNA will control any remaining dissolved COCs. However, evaluation of whether additional applications would be required will be made from performance data.

Depending on the cleanup level achieved with thermal treatment for VOCs, it is anticipated that enhanced ISB in the treated DNAPL areas be implemented in a grid fashion with 25 by 25 ft spacing. Two events as described for other enhanced ISB will be implemented. Additionally, enhanced ISB would be required in the treated DNAPL areas due to the presence of perchlorate which is not readily removed by thermal treatment. Enhanced ISB application will occur when the temperature of the thermally treated area cools to below 30 °C.

In-situ Thermal Desorption for DNAPL. Under Alternative 5 the two identified areas of DNAPL groundwater will be treated using ISTD. These areas include the former UEP area extending approximately 35,500 ft^2 (ERH or Conductive Heating Area 1 on **Figure 2-16**) and the former ACD area extending approximately 5,000 ft^2 (ERH or Conductive Heating Area 2 on **Figure 2-16**) with a depth of impact to approximately 50 ft in the former UEP area and to 30 ft in the former ACD area. Groundwater extraction may be implemented as part of the in-situ treatment to physically remove mass and to control the hydraulic gradient.

ERH delivers electricity through subsurface media via an array of electrodes. The heat generated by electrical resistance typically can raise subsurface temperatures to around the boiling point of water. The steam produced from pore-water serves as a medium to carry out volatilized VOCs for capture via soil vapor extraction (SVE) and subsequent ex-situ treatment of extracted vapors. In addition, the applied heat can increase hydrolysis of chlorinated solvents, such as MC and promote in-situ biological activity in two ways. First, biological activity is boosted by moderately high temperatures (30 °C) found at the periphery of the heated area during active thermal treatment, and throughout the heated area as it cools. Second, high temperatures increase the solubility of DNAPL, resulting in an increase in contaminant concentrations in the dissolved form that the microbes are able to use, provided the concentrations of the dissolved COCs are not toxic to the microorganisms.

The remedial design will finalize the selection of thermal technology. The conceptual design used to develop initial costs assumed that 25 vapor extraction points will be used to a depth of 15 ft bgs using stainless steel material. Extraction would be conducted using a liquid ring vacuum pump and a thermal oxidizer would be used to treat the vapors. Air flow capacity is estimated at 4,000 cubic ft per minute.

Removal of residual DNAPL via thermal treatment and extraction will remove at least 99.9% according to the thermal vendors even within low permeability zones. Thermal treatment also enhances mobilization of organic matter from the soil to groundwater, which will act to enhance biodegradation of the COCs. Additionally, higher ambient soil temperature imposed by the thermal treatment process during startup and cool down periods will increase the biodegradation rate by a factor of 2 for every 10 °C increase in ambient soil temperature up to approximately 25 °C above which bacterial activity would decrease. Application of thermal treatment in the southern area of the UEP will also remove COCs in the unsaturated zone (e.g., area represented by 18CPT21) that would otherwise be subject to excavation. Therefore, the volume requiring excavation could be reduced by approximately 6,000 yd^3.

Groundwater extraction near the thermally treated areas might have to be ceased temporarily to reduce the groundwater flux through the area, which requires additional heating capacity.

The presence of DNAPL in the ACD area may extend farther to the north toward ICT-12E and monitoring well 120, increasing the area to be treated for DNAPL. Therefore, the cost estimate for the DNAPL area in the vicinity of the ACD may become larger and will be considered during the RD phase.

MNA for both shallow zone and Wilcox Formation groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas (after treatment). For the MNA performance evaluation, USEPA 1999 is cited as the guiding document for evaluating effectiveness of MNA. A monitoring program will be designed and implemented to evaluate enhanced MNA of VOCs and perchlorate in the shallow zone inside and outside the containment area after completion of active remediation as may be necessary. The monitoring program will also monitor for COCs in the upper Wilcox Formation. LTM will be conducted to confirm that contaminant concentrations are being reduced to acceptable levels over time.

No NA information is available for Wilcox Formation wells at this time because the majority of Wilcox Formation wells that are impacted were installed since May 2013 and only two to three data points are available for these wells. New data will need to be evaluated for NA in the Wilcox Formation.

For this alternative, it is assumed that a monitoring program will be designed and implemented in accordance with USEPA guidance (USEPA, 1998; USEPA, 2004) to evaluate the effectiveness of NA at the Site. A total of 92 monitoring wells are currently available to provide groundwater data (32 Wilcox Formation wells and 60 shallow zone wells).

MNA sampling would be a part of groundwater monitoring plans. MNA sampling will be performed quarterly for the first two years, semi-annually for the next three years, annually for the next five years and then every two years. After that, the sampling frequency may be changed to once every five years if the data suggest less frequent sampling is appropriate. For costing purposes, a 30-year monitoring program is assumed. The analytical program will consist of VOCs, metals, perchlorate, and 1,4-dioxane, among others. The full list of MNA parameters would be developed during the RD phase. For cost estimating purposes, 4 Wilcox monitoring wells and 12 shallow monitoring wells were assumed for sampling (20 samples with QC). The MNA network is expected to be more expansive than assumed for costing purposes, and the locations and number of wells to be used for MNA will be developed during the RD phase.

Annual reports will be prepared to document the program. The second year annual report will include a review of the first eight rounds of sampling and provide the rationale for MNA as an effective part of the remedial alternative. Sampling frequency, reporting frequency, or analytical suite may be modified based on the results of the sampling program.

Major components of the MNA remedy include:

- **MNA to return groundwater to its potential beneficial use, wherever practicable.** Historic data suggest that NA of COCs is occurring at the Site; however, additional data collection is necessary to fully evaluate NA. Monitoring wells will be sampled for eight consecutive quarters to evaluate and confirm the occurrence of NA in conjunction with historical data. Data from the eight quarterly events will be combined with historic data to evaluate the effectiveness of various natural physical, chemical, and biological processes in reducing contaminant concentrations. If MNA is not found to be effective in areas outside of direct active treatment, a contingency remedy may be implemented. The contingency remedy would be determined based on aquifer conditions at that time. The monitoring details associated with MNA will be presented in the RD.

- **Performance objectives to evaluate the MNA remedy performance after two years.** Each of the general performance objectives must be met as indicated below. If the criteria are not met to illustrate that MNA is an effective remedy, the contingency action will be initiated. If MNA is effective, a baseline will be established from the data to this point in time. Specific evaluation criteria will be developed in the RD. The MNA evaluation will be based on the USEPA lines of evidence (USEPA, 1999) as follows:
    - Plume stability (i.e., the plume concentrations are decreasing in the majority of performance wells, and the plume is not expanding in area as demonstrated with compliance wells)
    - MNA Process Evaluation demonstrated based on an attenuation rate calculated with empirical performance monitoring data, and MNA Process Demonstration based on the presence of daughter products and bacterial culture counts

- **A contingency remedy to enhance MNA** to reach the RAOs if MNA is found to be ineffective. The area and the elements of the contingency remedy would be selected based on the entire data set available. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Development and specific description of the contingency remedy would be presented in a RD/RAWP.

- **Initiate LTM.** Monitoring will be conducted to evaluate the remedy performance and determine if the plume conditions remain constant, improve or worsen after the baseline is established. LTM will be implemented at a frequency of semiannual for three years, then annually until the next five-year review. The performance monitoring plan will be developed in the RD and will be based on USEPA guidance (USEPA, 2004).
    - Continue LTM annually thereafter until recommended otherwise by the five-year review to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen. The baseline of the plume for future five-year reviews will be established as part of the MNA evaluation program. The initial LTM plan will be developed during RD.
    - Groundwater monitoring would be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose would be evaluated at five year reviews.

- **Land Use Control.** The LUC objectives include maintaining the integrity of any current or future remedial or monitoring systems, maintaining the surface impoundment cap over the UEP, and preventing the use of groundwater contaminated above cleanup levels as a potable water source.

- The groundwater treatment and MNA remedial components include a groundwater monitoring system that will be used to characterize the condition of the groundwater during the period the groundwater remedy is in place until the groundwater remediation goals are achieved, and to demonstrate achievement of the groundwater remediation goals when the groundwater remedy is complete. As a part of this groundwater remedy, the U.S. Army will maintain the remedial and monitoring systems associated with the groundwater remedies until these components of the remedy are no longer needed to achieve cleanup levels, and cleanup levels have been achieved. During the period of operation of the groundwater remedy, if any of the elements of the remedial and groundwater monitoring systems are damaged, destroyed, or become ineffective, they will be repaired or replaced with suitable components to assure that the remedial and groundwater monitoring systems are able to provide data of the quality necessary to determine the progress of and eventual completion of this component of the remedy.

- The actions to be taken to implement these LUC objectives and requirements will be provided through modifying the "Comprehensive Land Use Control (LUC) Management Plan, Former Longhorn Army Ammunition Plant, Karnack, Texas" and detailed in the LUC RD.
    - The LUC for prohibition of groundwater use (except for monitoring and testing) shall be implemented and shall remain in place at the Site until the COCs (i.e. including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soil and groundwater remaining at the Site are reduced below levels that would support unlimited use and unrestricted exposure. A LUC RD will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD, the U.S. Army will propose deadlines for completion of the RD Work Plan, RD and Remedial Action Work Plan. The documents will be prepared and submitted to the USEPA and the TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. The long-term groundwater and surface water monitoring and MNA performance monitoring plan will also be presented in the RD. The recordation notification for the Site which will be filed with Harrison County, will include a description of the LUCs. The preliminary boundary for the groundwater LUC is shown on **Figure 2-18**.
    - The LUC restricting land use to nonresidential shall be implemented until it is demonstrated that surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure.
    - The LUC to maintain the integrity of any current or future remedial or monitoring systems will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in groundwater are met. The LUC to prohibit groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs (i.e., all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soil and groundwater allow for unlimited use and unrestricted exposure.
    - The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of U.S. Army-owned property, the U.S. Army will provide written notice of the LUCs to the transferee of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the U.S. Army shall provide USEPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the U.S. Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the LUCs relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

LUC implementation and maintenance actions will be described in the RD for LHAAP-18/24. The LUCs would be included in the property transfer documents and a recordation of them filed in the Harrison County Courthouse. The LUCs will prevent human exposure to groundwater contaminated with chlorinated solvents, explosives, metals, and perchlorate through the prohibition of groundwater use (except for environmental monitoring and testing), restrict land use to nonresidential, require maintenance of the integrity of any current or future remedial or monitoring systems and prevent the use of groundwater contaminated above cleanup levels as a potable water source. In addition, within 90 days of signature of this ROD, the U.S. Army shall request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions based on a preliminary LUC boundary. Within 21 days of the issuance of the ROD, the U.S. Army will propose deadlines for completion of the RD Work Plan, RD, and Remedial Action Work Plan. The documents will be prepared and submitted to USEPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. Consistent with the dates presented for these documents, the U.S. Army shall: 1) request the Texas Department of Licensing and Regulation to notify well drillers of the final boundary of groundwater use prohibitions; and 2) notify the Harrison County Courthouse of the LUCs to include a map showing the area of groundwater use prohibition at the site, in accordance with 30 TAC 335.565.

Monitoring activities associated with the LUCs would be undertaken to confirm that groundwater is not being used. Long-term operational requirements under this alternative would include maintenance of the LUCs. Groundwater monitoring will demonstrate no migration of the plume and the eventual reduction of contaminates to levels below cleanup levels. The need for continued groundwater monitoring will be evaluated every 5 years during the reviews. Sampling frequency and analytical requirements will be presented as an appendix to the RD for LHAAP-18/24.

Maintenance of the existing cap over the former UEP. The closure cap over the UEP will be maintained in good condition, preventing erosion and maintaining vegetative cover to reduce infiltration in this area and prevent any contamination present in the unsaturated soil beneath the UEP from migrating to groundwater.

The former UEP was closed as a surface impoundment under RCRA in 1986 and capped by 1987. The UEP cap design consisted of removing the sludge, filling the UEP with common fill, covering the common fill with 4 ft of compacted clay, then applying 1 foot of sand, covered by 1 foot of topsoil. The surface of the cap has an average slope of three percent on top while the sides have a vertical to horizontal ratio of 1:4. It is graded and equipped with a sand drainage layer to promote sheet flow runoff to minimize erosion.

This cap would continue to be monitored, maintained, and repaired, as necessary, to ensure long-term effectiveness. This includes inspections of the cap to check for erosion, settlement, and deep-rooted vegetation, and implementation of necessary repairs. Routine maintenance and repair of the cap will include actions needed to ensure that the integrity of the cap is maintained (e.g., mowing, seeding, and settlement/erosion repair). A LUC restricting intrusive activities would be implemented to ensure the integrity of the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

The importance of maintaining the cap is to prevent contaminants present in the unsaturated soil from leaching to groundwater. Three locations within the UEP identified the presence of contaminants within the unsaturated zone above the water table (18CPT21, 18CPT25, and 18CPTUEP05). The highest contamination was reported in 18CPT21. The presence of the cap provides a significant protection of this soil as long as cap maintenance continues to minimize infiltration of rain water. The runoff water from the UEP cap will be drained to off-site locations to avoid infiltration of rain water inside the containment.

2.12.3 Cost Estimate of the Selected Remedy

Table 2-12 presents the present worth analysis of the cost for the selected remedy, Alternative 5. The information in the table is based on the best available information regarding the anticipated scope of the remedial alternative. The quantities used in the estimate are for estimating purposes only. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Changes will be documented in accordance with 40 CFR 300.435(c)(2) in the form of a memorandum in the Administrative Record, an Explanation of Significant Difference (ESD), or a ROD amendment, as necessary. This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost.

The total project present worth, capital, and O&M costs for Alternative 5 is shown in **Table 2-12** below. The costs were developed using a discount rate of 3%. The O&M costs include evaluation of MNA, maintenance of the LUC, and LTM through Year 30. The LTM would support the required CERCLA five-year reviews.

2.12.4 Expected Outcomes of Selected Remedy

The purpose of this response action is to attain the RAOs stated in **Section 2.8** of this document. **Table 2-10** presents the cleanup levels. The cleanup levels for the COCs in the groundwater are the Federal SDWA MCLs, or in the absence of federal drinking water standards, the cleanup level is the TRRP Tier 1 Groundwater Residential PCL ($^{GW}GW_{Ing}$). The cleanup level for the soil is the GWP-Ind MSC

The expected outcome of the selected remedy is that contaminants in soil and groundwater will be reduced to the cleanup levels. Achievement of the cleanup levels (**Table 2-10**) is anticipated to be completed in approximately 20 years, however considering the lithologic variability, particularly the lateral and vertical change from sand to clay, the time to achieve the cleanup levels may vary by an order of magnitude. This approximate timeframe to achieve cleanup levels is considered reasonable for the anticipated future land use as a national wildlife refuge. In the short-term (prior to the groundwater achieving cleanup levels), it is anticipated the site will be made part of a national wildlife refuge operated by USFWS, and will continue as such in the long-term (after the groundwater achieves cleanup levels).

In addition, the monitoring activities associated with MNA will confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass, and protection of surface water through containment of the plume. Until that time, the LUC for groundwater will prohibit the use of the site's groundwater except for environmental monitoring and testing. When the groundwater remedial action goals are achieved, the LUC will be removed.

As part of the evaluation of MNA, attenuation rates are computed and evaluated in accordance with the USEPA guidance material (USEPA, 1998). Time-dependent attenuation rate constants and estimated in-well cleanup times are determined based on COC concentration data over time from individual wells assuming first order degradation kinetics. Attenuation rates are calculated for the monitoring wells with the highest concentrations for which the available data allow such a calculation. Attenuation rates are based on the following formula from the USEPA guidance (USEPA, 1998):

$C = C_o e^{-kt}$

where: C = concentration at time t
C_o = initial concentration
k = attenuation rate constant (first order reaction)

2.13 Statutory Determinations

Under CERCLA §121 and the NCP, the U.S. Army must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets the statutory requirements.

2.13.1 Protection of Human Health and the Environment

The selected remedy, Alternative 5, will achieve the RAOs for LHAAP-18/24. Implementation of the LUCs would restrict intrusive activities at the surface impoundment cap and prevent human access and exposure to contaminated soil beneath the cap and groundwater that poses an unacceptable risk to human health until the remedy achieves the RAOs. The LUCs would include land use notification at the Harrison County courthouse and periodic surveillance of LHAAP-18/24 to ensure that use restrictions are not being violated. The U.S. Army would include the notice with any transfer letter to the USFWS for the intended future use as a national wildlife refuge. If transferred out of U.S. government control, deed restrictions would be placed on the property to prohibit or restrict property uses that may result in exposure to groundwater (e.g., drinking water well installation). Continued maintenance of the LUC for groundwater would prevent human access and exposure to groundwater that poses an unacceptable risk to human health, until COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soils and groundwater, have sufficiently degraded to levels that allow for unlimited use and unrestricted exposure.

With implementation of ISB on three sides outside the containment, in the Wilcox Formation, and inside the containment in five areas, removal of potential unsaturated source soils, ISTD remediation of secondary source areas in the saturated soil inside the containment area in two distinct areas (former UEP and former ACD), and enhanced groundwater extraction inside the containment as needed, this alternative should accelerate the process of achieving the RAOs. No reliance on NA is proposed for this alternative. Since NA is occurring at the site, its use as part of the remedy is inevitable. NA inside the containment is a feasible option to polish the residual COCs remaining after ISTD and ISB implementation are completed.

Groundwater use restrictions would remain in place until groundwater extraction, as needed and eventually NA reduces contaminant levels inside and outside the containment and in the Wilcox Formation to allow unrestricted use and unlimited exposure. The LUCs for soil and groundwater will be maintained until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soil and groundwater allow for unlimited use and unrestricted exposure.

A monitoring program that would track the continual attenuation of the groundwater COCs and verify that contamination is not reaching Harrison Bayou will be implemented. The LTM program would provide information to support Five-Year Reviews and the termination of the remedy when cleanup levels have been met.

The treatment system and enhanced groundwater extraction, as needed, would continue to be operated to prevent migration of COCs from the containment area and reduce the concentrations of those COCs over time inside and outside the containment area. The treatment system and other active remedies would eventually achieve concentrations throughout the containment area and outside the containment area that could be addressed via NA.

2.13.2 Compliance with ARARS

The selected remedy complies with all ARARs. The ARARs and non-procedural considerations are presented below and in **Table 2-13**.

Chemical-Specific ARARs

- **Groundwater:** Cleanup levels are presented in **Table 2-10**. The cleanup goal for groundwater will be the SDWA MCLs as specified in 40 C.F.R. §§ 141.61 and 141.62, which meet health-based standards and criteria. In the absence of federal drinking water standards, clean-up levels will be based on TRRP Tier 1 Residential Groundwater PCLs.

  This alternative will return the contaminated shallow and intermediate groundwater zones at LHAAP-18/24 to their potential beneficial use as drinking water, wherever practicable, given the particular circumstances of the site, which for the purposes of this ROD is considered to be attainment of the relevant and appropriate SDWA MCLs, and consistent with 40 C.F.R. § 300.430(e)(2)(i)(B&C). If a return to potential beneficial uses is not practicable, this alternative would still meet the NCP expectation to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction.

- **Soil**: There are no federally promulgated chemical-specific ARARs for soil. The State of Texas promulgated cleanup standards under 30 TAC 335, Subchapter S, specifically 30 TAC 335.559 (g)(2) which specifies contaminant concentration limits for nonresidential soil and are used as the chemical-specific ARARs for the site soils. The concentrations represent the non-residential soil-to-groundwater cross-media protection concentrations that must be met to demonstrate that a contaminant in soil does not pose the potential for a future release of leachate in excess of the groundwater concentration considered to be protective for nonresidential worker exposure. It is anticipated that removal of contaminated soils above the Texas standards will prevent further contamination of the groundwater from soil at the site.

- **Surface water**: Section 121(d)(2) of CERCLA states that every remedial action shall require a level of control which at least attains surface water quality criteria established under Sections 304 or 303 of the Clean Water Act of 1972 (CWA) where such goals and criteria are relevant and appropriate under the circumstances of the release or threatened release. Therefore, surface water quality criteria may be ARARs if there is a remedial action that affects surface water, and measures will be implemented during construction to prevent off-site migration of contaminants to surface waters. In the event of remedy failure resulting in or potentially resulting in a release to surface water, 40 C.F.R. §§ 122, 125, 129, and 130 – 131 and 30 TAC 307.4, 307.6, 307.7, 307.8 and 307.9 are considered potential future ARARs. Chemical-specific ARARs for surface water consumption are appropriate and relevant. Specifically, Texas surface water quality standards are set forth in 30 TAC §307.6(d)(1). For COCs that are not listed in Table 2 of 30 TAC §307.6(d)(1), the TRRP Tier 1 Residential Groundwater PCL for those COCs would apply.

  The extracted groundwater will be treated to the levels established by TCEQ Water Quality Division. The treated water will be discharged to Harrison Bayou. **Table 2-14** identifies the current discharge criteria, however the discharge criteria will be established during the RD phase.

Location-Specific ARARs

The discharge limits for extracted and treated groundwater, calculated by the TCEQ Water Quality Division, are also considered location-specific ARARs and discussed under the chemical-specific ARARs.

Action-Specific ARARs

The selected remedy has potential action-specific ARARs related to the following activities: site preparation and soil excavation activities, waste and disposal activities, well construction, and water treatment.

- **Site Preparation, Construction, and Excavation Activities.** Certain on-site preparation, construction, and/or excavation activities will be necessary to prepare the site for remediation, including the soil-moving or site-grading activities. Control of fugitive emissions and storm water runoff during implementation of these activities will be required. Airborne particulate matter resulting from construction or excavation activities is subject to the fugitive dust and opacity limits listed in 30 TAC 111, Subchapter A. No person may cause, suffer, allow, or permit visible emissions from any source to exceed an opacity of 30 percent for any 6-minute-period (30 TAC 111.111(a)). Reasonable precautions must also be taken to achieve maximum control of dust to the extent practicable, including the application of water or suitable chemicals or the complete covering of materials (30 TAC 111.143 and 30 TAC 111.145). Texas has also promulgated general nuisance rules for air contaminants mandating that no person shall discharge from any source whatsoever one or more air contaminants, or combinations thereof, in such concentration and of such duration as are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property (30 TAC 101.4). Storm water discharges from construction activities that disturb equal to or greater than one acre of land must comply with the substantive requirements of a USEPA National Pollutant Discharge Elimination System general permit (40 C.F.R. § 122.26), depending on the amount of acreage disturbed. Substantive requirements include implementation of good construction management techniques; phasing of large construction projects; minimal clearing; and sediment, erosion, structural, and vegetative controls to mitigate runoff and ensure that discharges meet required parameters.
- **Waste and Disposal Activities.** The processes of monitoring and treating contaminated groundwater may generate a variety of primary and secondary waste streams (e.g., soil, personal protective equipment, and dewatering and decontamination fluids). These waste streams are expected to be nonhazardous waste. All solid waste (defined as any solid, liquid, semisolid, or contained gaseous material intended for discard (40 C.F.R. § 261.2) generated during remedial activities must be appropriately characterized to determine whether it contains RCRA hazardous waste (40 C.F.R. § 262.11; 30 TAC 335.62; 30 TAC 335.503(a)(4); 30 TAC 335.504). If feasible, secondary waste streams generated due to dewatering, well development activities, or from decontamination activities will be sent to the LHAAP-18/24 wastewater treatment facility for further treatment in accordance with applicable regulations. All wastes must be managed, stored, treated (if necessary), and disposed of in accordance with the ARARs for waste management listed in **Table 2-13** for the particular type of waste stream or contaminants in the waste.
- **Well Construction.** The remedial action may involve the placement, use, or eventual plugging and abandonment of some type of groundwater monitoring, injection, and/or extraction wells, either for in situ treatment or extraction of the contaminated groundwater or for LTM of the groundwater. Available standards for well construction and plugging/abandonment provide ARARs for such actions and include 30 TAC 331, Subchapters A and H. Specific provisions 30 TAC §331.9(a); 30 TAC §331.10(a); 30 TAC

§331.10(d); 30 TAC §331.21; 30 TAC §331.132(a); 30 TAC §331.132(c); 30 TAC §331.132(d)(1); 30 TAC §331.132(d)(4); 30 TAC §331.133(e) apply. Texas has promulgated technical requirements in Chapter 76 of Title 16 of the TAC applicable to construction, operation, and plugging/abandonment of water wells. In particular, 16 TAC 76.1000 (*Locations and Standards of Completion for Wells*), 16 TAC 76.1002 (*Standards for Wells Producing Undesirable Water or Constituents*) (LHAAP-18/24 contaminated groundwater could be considered "undesirable water" defined pursuant to Section 76.10[36] as "water that is injurious to human health and the environment or water that can cause pollution to land or other waters"), 16 TAC 76.1004 (*Standards for Capping and Plugging of Wells and Plugging Wells that Penetrate Undesirable Water or Constituent Zones*), and 16 TAC 76.1008 (*Pump Installation)* may provide ARARs for the placement, construction, and eventual plugging/abandonment of groundwater injection or extraction wells or the placement and long-term operation of groundwater monitoring wells for groundwater remedial strategies.

- **Water Treatment.** Contaminated groundwater and wastewaters collected during well drilling or decontamination activities could be transported to the groundwater treatment plant at LHAAP-18/24 for processing, and would subsequently be discharged in compliance with the effluent limits for that plant. Such waters would be characterized, as required, before transport and managed accordingly in compliance with requirements for the type of waste contaminating the water. To assure compliance with the groundwater treatment plant's discharge limits, the incoming water must meet the waste acceptance criteria for the facility. On-site wastewater treatment units (as defined in 40 C.F.R. § 260.10) that are part of a wastewater treatment facility that is subject to regulation under Section 402 or Section 307(b) of the Clean Water Act of 1972 are not subject to RCRA Subtitle C hazardous waste management standards (40 C.F.R. §270.1(c)(2)(v); 40 C.F.R. § 264.1(g)(6); 30 TAC 335.429(d)(1)). The USEPA has clarified that this exemption applies to all tanks, conveyance systems, and ancillary equipment, including piping and transfer trucks, associated with the wastewater treatment unit (Federal Register Title 53, 34079, September 2, 1988).
- **Post-Closure Care.** Substantive requirements of closure and post-closure ARARs include 30 TAC 335.174 and 40 CFR § 264.228 addressing surface impoundments storing hazardous waste. Closure requirements were met during implementation of the cap. Post-closure requirements are relevant and appropriate, and include 40 CFR § 264.228(b)(1), (3) and (4). In addition, those substantive requirements of 40 CFR §§ 264.117-120 related to post-closure for the remedy in place are relevant and appropriate.

Other Considerations

Activities that would be conducted under Alternative 5 are similar to current activities of groundwater extraction, treatment monitoring, and discharge and would comply with all procedural considerations described in **Table 2-13**. ISB source area remediation, and soil excavation will be implemented in areas that have already been disturbed. No activities would take place in sensitive environments such as wetlands, and no impacts to archeological resources or threatened and endangered species are anticipated. Compliance with the substantive requirements with waste generation, temporary storage, characterization, and off-site disposal are being carried out at this site and will be complied with during implementation of the remedy.

2.13.3 Cost-Effectiveness

Table 2-12 presents the present worth analysis of the cost estimate for the selected remedy. The information in the table is based on the best available information regarding the anticipated scope of the remedial alternative. The capital cost for the selected remedy is $19.52M, with O&M costs of $13.13M, and total cost of $32.667M. The quantities shown are for estimating purposes only. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. The progression of total present value costs from the least expensive alternative to the most expensive alternative is as follows (provided no contingencies are implemented): Alternative 1, Alternative 3, Alternative 2, Alternative 4, Alternative 5, and Alternative 6.

There are no costs associated with Alternative 1 because no remedial activities would be conducted. Alternative 6 has highest capital costs due to the high cost of ZVI, but lower O&M costs than all other alternatives with the exception of Alternatives 3 and 5. Alternative 5 has an O&M cost over 20 years after which the GWTP and extraction would be shut down. Alternative 5 has a higher capital cost associated with thermal treatment compared to Alternatives 2, 3, and 4. Alternatives 2, 3, and 4 have the lowest capital costs of the active remedial alternatives, with Alternative 3 having the lowest capital cost associated with slurry wall construction and lowest O&M cost due to the greater cost reductions in O&M associated with reduction in GWTP operation and reduction in monitoring costs (this alternative does not require full extraction of groundwater). Alternatives 2, 4, and 6 have the highest O&M costs of all the alternatives because it is assumed that GWTP operations will continue for 30 years with no reduction in extraction rates.

Although Alternative 5 is not the least expensive alternative, it is expected to achieve site RAOs in the shortest period of time compared to the other alternatives. Costs for Alternatives 2, 4, and 5 differ by approximately $2M, or vary from one another by approximately 5% or less, suggesting that cost may be a less significant differentiator for these alternatives than other criteria.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The U.S. Army has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Soil excavation would remove impacted soils, and in-situ treatment and groundwater extraction, as needed would irreversibly reduce groundwater contaminant concentrations in the treated portions of the groundwater plume. MNA will reduce groundwater contaminants to cleanup levels. The LUC for the maintenance of the monitoring system will be maintained until the groundwater cleanup levels are achieved. The LUCs for soil and groundwater will be maintained until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) allow for unlimited use and unrestricted exposure. In the short-term (prior to the groundwater achieving cleanup levels), the site will be made part of a national wildlife refuge operated by USFWS, and will continue as such in the long-term (after the groundwater achieves cleanup levels).

The selected remedy would provide reduction in toxicity, mobility, and volume of the groundwater contaminants via active treatment of the most contaminated areas. The selected remedy would document effectiveness through the confirmation of MNA and the routine monitoring of the attenuation and migration of the contaminants in groundwater.

The selected remedy would provide immediate protection because the LUCs would be implemented quickly. Maintenance of this control would be required until COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) and by-product (daughter) contaminant concentrations in soil and groundwater allow for unlimited use and unrestricted exposure.

2.13.5 Preference for Treatment as a Principal Element

The selected remedy would reduce the toxicity, mobility, or volume of contaminants in the groundwater through an active remedial process. By utilizing ISTD and EISB as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied. In addition, there is a potential principal source threat at LHAAP-18/24 residing as residual DNAPLs in groundwater. The DNAPLs will be addressed during remediation with ISTD.

2.13.6 Five-Year Review Requirements

Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(C) provide the statutory and legal bases for conducting five-year reviews. Because this remedy will result in contaminants that remain on site above levels that allow unlimited use and unrestricted exposure, a review will be conducted at least every five years to confirm that the remedy continues to provide adequate protection of human health and the environment.

2.14 Significant Changes from the Proposed Plan

The Proposed Plan for LHAAP-18/24 was released for public comments on April 2, 2019. The Proposed Plan identified Alternative 5 as the Preferred Alternative for groundwater remediation.

Verbal comments were discussed during the public meeting held on April 25, 2019, and the U.S. Army provided responses as recorded in the meeting transcript, available in the Administrative Record (http://www.longhornaap.com/admin-record). The U.S. Army reviewed all written comments submitted during the public comment period. After careful consideration of the comments, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate at that time.

Table 2-1. Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical	Concentration Detected[1] (mg/L)		Frequency of Detection	Exposure Point Concentration (mg/L)	Statistical Measure
		Minimum	Maximum			
Ingestion, inhalation, dermal contact	*Dioxin/Furan*					
	2,3,7,8-TCDD TEC			---	2.32E-09	maximum
	Explosives					
	2,4-Dinitrotoluene	ND	ND	0/4	5.30E-01	maximum
	1,3,5-Trinitrobenzene	0.001	0.001	1/6	1.00E00	
	2,6-Dinitrotoluene	ND	ND	0/4	5.30E-01	maximum
	4-Nitrotoluene	ND	ND	0/4+	2.10E+00	maximum
	Metals					
	Antimony	0.012	0.333	5/26	3.33E-01	maximum
	Barium	0.039	6.0	25/26	6.00E+00	maximum
	Chromium	0.01	18.0	20/26	1.8E+01	maximum
	Cobalt	0.11	0.28	2/6	2.8E-01	
	Lead	0.002	0.018	9/26	1.8E-02	maximum
	Manganese	0.022	2.41	6/6	8.27E+00	maximum
	Nickel	0.044	9.6	7/26	9.60E+00	maximum
	Silver	0.01	0.48	4/26	4.8E-01	maximum
	Strontium	0.12	4.4	6/6	4.4E+00	maximum
	Thallium	0.0017	0.0037	6/26	3.70E-03	maximum
	Non-Metallic Anion					
	Perchlorate	8.00E-03	8.80E+01	13/30	6.90E+01	maximum
	Volatile Organics					
	Bromodichloromethane	0.005	0.007	3/26	7.0E-03	maximum
	Chloroform	0.009	0.028	6/26	2.80E-02	maximum
	cis-1,2-Dichloroethene	0.250	0.250	1/6	2.50E-01	maximum
	Methylene chloride	0.0029	730	8/26	7.30E+03	maximum
	Toluene	0.003	0.003	1/26	3.00E-03	maximum
	Trichloroethene	0.0039	210	8/26	2.10E+02	Maximum

Table 2-1. Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations (continued)

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Soil (0 to 0.5 feet below ground surface)

Exposure Point	Chemical	Concentration Detected[1] (mg/L)		Frequency of Detection	Exposure Point Concentration (mg/L)	Statistical Measure
		Minimum	Maximum			
Ingestion, inhalation, dermal contact	*Dioxin/Furan*					
	2,3,7,8-TCDD TEC	2.63E-07	7.71E-06	---	1.79E-06	maximum
	Metals					
	Barium				2.81E+02	95% UCL
	Lead				1.29E+03	maximum
	Mercury	0.12	0.22	3/75	1.10E+00	maximum
	Thallium				2.14E+00	maximum
	Semi-Volatile Organics					
	Benzo(b)flouoranthene	2.45E-02	7.03E-02	5/6	7.50E-01	maximum

[1] Minimum/maximum detected concentration above the reporting limit

For groundwater, the maximum detected concentrations were used to estimate the exposure point concentration.
For soil, the 95% UCL values were used to estimate the exposure point concentration if the concentration exceeded the average and was below the maximum detected; otherwise, the maximum detected concentration was used to estimate the exposure point concentration.

---: No information available
95% UCL: 95% upper confidence level of the mean
mg/kg: milligrams per kilogram
mg/L: milligrams per liter
TCDD: tetrachlorodibenzo-p-dioxin
TEC: toxicity equivalence concentration

References:
Jacobs Engineering Group, Inc. (Jacobs), 2002, *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou, and Caddo Lake), Longhorn Army Ammunition Plant, Karnack, Texas*, Final, Oak Ridge, TN, August.

Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations:
The table presents the chemicals of potential concern (COPCs) and exposure point concentration (EPC) for each (i.e. the concentration used to estimate the exposure and risk from each COPC). The table includes the range of concentrations detected for each COPC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and the statistical measure upon which the EPC was based. The COPCs listed are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2002).

Table 2-2. Carcinogenic Toxicity Data Summary

Pathway: Ingestion, Dermal Contact				
Chemical of Concern	Oral Cancer Slope Factor (mg/kg-day)-1	Dermal Cancer Slope Factor (mg/kg-day)-1	Weight of Evidence/ Carcinogen Guideline Description	Source/ Date
Dioxin/Furans				
2,3,7,8-TCDD TEC	1.50E+05	3.00E+05	Not Classified	---
Explosives				
1,3,5-Trinitrobenzene	NTV	NTV	Not Classified	
2,4-Dinitrotoluene	6.80E-01	8.00E-01	B2	TCEQ, 2001
2,6-Dinitrotoluene	6.80E-01	8.00E-01	B2	TCEQ, 2001
4-Nitrotoluene	NTV	NTV	Not Classified	---
Metals				
Antimony	NTV	NTV	Not Classified	---
Barium	NC	NC	D	TCEQ, 2001
Chromium (total)	NC	NC	Not Classified	---
Cobalt				
Lead	NTV	NTV	Not Classified	---
Manganese (non-diet)	NC	NC	D	TCEQ, 2001
Mercury	NC	NC	D	TCEQ, 2001
Nickel	NTV	NTV	A	TCEQ, 2001
Silver	NC	NC	D	TCEQ, 2001
Strontium	NTV	NTV	Not Classified	---
Thallium	NC	NC	Not Classified	---
Non-Metallic Anions				
Perchlorate	NTV	NTV	Not Classified	---
Semi-Volatile Organics				
Benzo(b)fluoranthene	7.3E-01	8.2E-01	B2	TNRCC, 2001
Volatile Organics				
Bromodichloromethane	6.20E-02	6.33E-02	B2	TCEQ, 2001
Chloroform	6.10E-03	3.05E-02	B2	TCEQ, 2001
cis-1,2-Dichloroethene	NC	NC	D	TCEQ, 2001
Methylene chloride	7.50E-03	7.89E-03	B2	TCEQ, 2001
Trichloroethene	1.10E-02	1.10E-02	B2	TCEQ, 2001

Pathway: Inhalation			
Chemical of Concern	Unit Risk Factor $(mg/m^3)^{-1}$	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
Dioxin/Furans			
2,3,7,8-TCDD TEC	3.30E+04	Not Classified	---
Explosives			
1,3,5-Trinitrobenzene	NTV	Not Classified	---
2,4-Dinitrotoluene	NTV	B2	TNRCC, 2001
2,6-Dinitrotoluene	NTV	B2	TNRCC, 2001
4-Nitrotoluene	NTV	Not Classified	---

Table 2-2. Carcinogenic Toxicity Data Summary (continued)

Pathway: Inhalation (cont'd.)			
Chemical of Concern	Unit Risk Factor $(mg/m^3)^{-1}$	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
Metals			
Aluminum	NTV	Not Classified	---
Antimony	NTV	Not Classified	---
Barium	NC	D	TNRCC, 2001
Chromium (total)	NC	Not Classified	---
Lead	NTV	Not Classified	---
Manganese (Non-diet)	NC	D	TNRCC, 2001
Mercury	NC	D	TNRCC, 2001
Nickel	4.80E-01	A	TNRCC, 2001
Silver	NC	D	TCEQ, 2001
Strontium	NTV	Not Classified	---
Thallium	NC	Not Classified	---
Non-Metallic Anions			
Perchlorate	NTV	Not Classified	---
Semi-Volatile Organics			
Benzo(b)fluoranthene	8.80E-02	B2	TNRCC, 2001
Volatile Organics			
1,2-Dichloroethane	2.60E-02	B2	TNRCC, 2001
Bromodichloromethane	NTV	B2	TNRCC, 2001
Chloroform	2.30E-02	B2	TNRCC, 2001
cis-1,2-Dichloroethene	NC	D	TNRCC, 2001
Methylene chloride	4.70E-04	B2	TNRCC, 2001
Toluene	NC	D	TNRCC, 2001
Trichloroethene	1.70E-03	B2	TNRCC, 2001

Notes:
--- : No information available
mg/kg-day: milligrams per kilogram per day
mg/m^3: milligrams per cubic meter
NC: Chemical not classified as a carcinogen
NTV: no toxicity value available
TCDD: tetrachlorodibenzo-p-dioxin
TEC: toxicity equivalence concentration

Weight of Evidence/Carcinogen Guideline Description:
A - Human carcinogen
B1 - Probable human carcinogen – Indicates that limited human data are available
B2 - Probable human carcinogen – Indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen

References:
Jacobs Engineering Group, Inc. (Jacobs), 2002, *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou, and Caddo Lake)*, Longhorn Army Ammunition Plant, Karnack, Texas, Final, Oak Ridge, TN, August.

TNRCC), 2001, Update to 1998 Consistency Memorandum. Toxicity Factors Table, 15 March 2001. .

Summary of Toxicity Assessment:
The table provides carcinogenic risk information which is relevant to the contaminants of potential concern in soil and ground water. The list of chemicals of concern presented here are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2002).

Table 2-3. Non-Carcinogenic Toxicity Data Summary

Pathway: Ingestion, Dermal Contact						
Chemical of Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Dermal RfD (mg/kg-day)	Target Endpoint	Combined Uncertainty/ Modifying Factors	Source/Date
Dioxin/Furans						
2,3,7,8-TCDD TEC	chronic	NTV	NTV	NA	NA	---
Explosives						
1,3,5-Trinitrobenzene	chronic	3.00E-02	1.95E-02	Methemoglobinemia and spllenerthyroid cell hperplasia	100/1	USEPA-IRIS, 2001
2,4-Dinitrotoluene	chronic	2.00E-03	1.70E-03	Central nervous system effects	100/1	USEPA-IRIS, 2001
2,6-Dinitrotoluene	chronic	1.00E-03	8.50E-04	Central nervous system effects	3000/1	USEPA-HEAST, 1997
4-Nitrotoluene	chronic	1.00E-02	5.00E-03	Spleen lesions	10000/1	USEPA-HEAST, 1997
Metals						
Aluminum	chronic	1.00E+00	1.00E-01	NA	NA	---
Antimony	chronic	4.00E-04	6.00E-05	Longevity, blood glucose, and cholesterol	1000/1	USEPA-IRIS, 2001
Barium	chronic	7.00E-02	4.90E-03	Increased kidney weight	3/1	USEPA-IRIS, 2001
Beryllium	chronic	2.00E-03	1.40E-05	Small Intestine	300/1	USEPA-IRIS, 2001
Chromium (total)	chronic	1.50E+00	1.95E-02	No effects observed	100/10	USEPA-IRIS, 2001
Lead	chronic	NTV	NTV	NA	NA	---
Manganese (non-diet)	chronic	4.70E-02	2.82E-03	Central nervous system effects	1/1	USEPA-IRIS, 2001
Mercury	chronic	3.00E-04	2.10E-05	Autoimmune effects	1000/1	USEPA-IRIS, 2001
Nickel	chronic	2.00E-02	8.00E-04	Decreased Body Weight	300/1	USEPA-IRIS, 2001
Silver	chronic	5.00E-03	2.00E-04	Argyria	3/1	USEPA-IRIS, 2001
Strontium	chronic	6.00E-01	1.20E-01	Rachitic bone	300/1	USEPA-IRIS, 2001
Thallium	chronic	8.00E-05	8.00E-05	Blood	3000/1	USEPA-IRIS, 2001

Pathway: Ingestion, Dermal Contact						
Non-Metallic Anions						
Perchlorate	chronic	9.00E-04	9.00E-04	NA	NA	---
Semi-Volatile Organics						
Benzo(b) fluoranthene	chronic	NTV	NTV	NA	NA	
Volatile Organics						
1,2-Dichloroethane	chronic	3.00E-02	3.00E-02	NA	NA	---
Bromodichloromethane	chronic	2.00E-02	1.96E-02	Renal cytomegaly	1000/1	USEPA-IRIS, 2001

Table 2-3. Non-Carcinogenic Toxicity Data Summary (continued)

Pathway: Ingestion, Dermal Contact (cont'd.)

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Dermal RfD (mg/kg-day)	Target Endpoint	Combined Uncertainty/ Modifying Factors	Source/Date
Volatile Organics (cont'd.)						
Chloroform	chronic	1.00E-02	2.00E-03	Cyst formation in the liver	1000/1	USEPA-IRIS, 2001
cis-1,2-Dichloroethene	chronic	1.00E-02	1.00E-02	Decreased hematocrit and hemoglobin in the blood	3000/1	USEPA-IRIS, 2001
Methylene chloride	chronic	6.00E-02	5.70E-02	Liver toxicity	100/1	USEPA-IRIS, 2001
Toluene	chronic	2.00E-01	1.6E-01	Liver and kidney effects	1000/1	USEPA-IRIS, 2001
Trichloroethene	chronic	6.00E-03	6.00E-03	NA	NA	---

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC (mg/m^3)	Target Endpoint	Combined Uncertainty/ Modifying Factors	Source/ Date
Dioxin/Furans					
2,3,7,8-TCDD TEC	chronic	NTV	---	---	---
Explosives					
1,3,5-Trinitrobenzene	NTV	-	-	-	-
2,4-Dinitrotoluene	chronic	0.00015	NA	NA	---
2,6-Dinitrotoluene	chronic	0.00015	NA	NA	---
4-Nitrotoluene	chronic	0.011	NA	NA	---
Metals					
Aluminum	chronic	0.0035	NA	NA	---
Antimony	chronic	0.0005	Pulmonary toxicity, chronic interstitial inflammation	300/1	USEPA-IRIS, 2001
Barium	chronic	0.00049	Fetus, developmental effects	1000/1	USEPA-HEAST, 1997
Chromium (total)	chronic	0.0001	NA	NA	---
Cobalt	chronic	0.0000175	BA	NA	
Lead	chronic	NTV	---	---	---
Manganese (non-diet)	chronic	0.00005	Impairment of neurobehavioral function	1000/1	USEPA-IRIS, 2001
Mercury	chronic	0.0003	Hand tremor, memory loss	30/1	USEPA-IRIS, 2001
Nickel	chronic	0.0002	Respiratory effects	NA	ATSDR, 1997
Silver	chronic	0.00001	NA	NA	---
Strontium	chronic	NTV	---	---	---
Thallium	chronic	0.0001	NA	NA	---

Table 2-3. Non-Carcinogenic Toxicity Data Summary (continued)

Pathway: Inhalation (cont'd.					
Chemical of Concern	Chronic/ Subchronic	Inhalation RfC (mg/m³)	Target Endpoint	Combined Uncertainty/ Modifying Factors	Source/ Date
Non-Metallic Anions					
Perchlorate	chronic	NTV	---	---	---
Semi-Volatile Organics					
Benzo(b)fluoranthene	NTV	--	--	--	--
Volatile Organics					
Bromodichloromethane	chronic	NTV	---	---	---
Chloroform	chronic	0.000301	NA	NA	---
cis-1,2-Dichloroethene	chronic	0.793	NA	NA	---
Methylene chloride	chronic	3	Liver toxicity	100/1	USEPA-HEAST, 1997
Toluene	chronic	0.4	Neurological effects	300/1	USEPA-IRIS, 2001---
Trichloroethene	chronic	NTV	---	---	---

Notes:
---: No information for a compound with no toxicity value (NTV)
IRIS: Integrated Risk Information System, USEPA
mg/kg-day: milligrams per kilogram per day
mg/m³: milligrams per cubic meter
NA: Information not available
NTV: No toxicity value available
RfC: Reference concentration
RfD: Reference dose
TCDD: tetrachlorodibenzo-p-dioxin
TEC: toxicity equivalence concentration

References:

Agency for Toxic Substances and Disease Registry (ATSDR), 1997, Minimal Risk Levels (MRLs) for Hazardous Substances.

Jacobs Engineering Group, Inc. (Jacobs), 2002, *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou, and Caddo Lake)*, Longhorn Army Ammunition Plant, Karnack, Texas, Final, Oak Ridge, TN, August.

USEPA-HEAST, 1997. Health Effects Summary Table (HEAST). FY 1995, Annual Office of Emergency and Remedial Response. Washington, D.C. EPA/340/R-95-036.

USEPA-IRIS, 2001. Integrated Risk Information System (IRIS). United States Environmental Protection Agency Online Database for Toxicity Information on Hazardous Chemicals, 2001.

Summary of Toxicity Assessment:
This table provides non-carcinogenic risk information relevant to the contaminants of concern in both soil and ground water. The list of chemicals of potential concern presented here are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2002). The uncertainty factor and modifying factor are used in the development of a references dose. The uncertainty factor adjusts results from dose-response studies in animals to make them applicable to humans. The modifying factor is used to account for uncertainties in the available toxicity data from which the reference dose is derived. In the risk assessment, the reference doses and concentrations were for the chronic case, to be conservative.

Table 2-4. Risk Characterization Summary – Carcinogens

Scenario Timeframe:	Future						
Receptor Population:	Maintenance Worker						
Receptor Age:	Adult						
Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Ground-water	Ground-water	Ingestion or exposure through showering	*Dioxin/Furan*				
			2,3,7,8-TCDD TEC	1.2E-06	NE	1.0E-05	1.1E-05
			Pesticides				
			4,4'-DDD	5.8E-07	NE	7.6E-07	1.3E-06
			Volatile Organics				
			Bromodichloromethane	1.5E-06	NTV	7.8E-07	2.3E-06
			Chloroform	6.0E-07	3.9E-05	2.3E-06	4.2E-05
			Methylene chloride	1.9E-01	2.1E-01	NE (Kp<=0.01)	4.0E-01
			Trichloroethene	8.1E-03	2.3E-01	1.1E-02	4.4E-01
						Groundwater risk total =	4.4E-01
Soil (0 to 0.5 feet)	Soil and particulates	Incidental Ingestion, inhalation of particulates, and dermal contact	*Dioxin/Furan*				
			2,3,7,8-TCDD TEC	9.4E-08	3.1E-12	3.6E-08	1.3E-07
			Semi-volatiles				
			Benzo(b)fluoranthene	1.9E-07	3.5E-12	1.8E-07	3.7E-07
						Soil risk total =	5.0E-07

Notes:

Kp	Dermal permeability coefficient
NA	Not applicable
NE	Not evaluated through this exposure pathway. Chemical is not identified as volatile.
NE(Kp<=0.01)	Based on USEPA Region 6 guidance, chemicals of potential concern with a Kp<=0.01 were not evaluated for dermal contact while showering (USEPA, 1995)
NTV	No toxicity value available
TCDD	Tetrachlorodibenzo-p-dioxin
TEC	Toxicity equivalence concentration

References:

U.S. Environmental Protection Agency (USEPA), 1989, *Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual, (Part A)*, EPA/540/1-89/002, December.

USEPA, *Supplemental Region VI Risk Assessment Guidance, May 5, 1995*.

Summary of Risk Characterization:

The table provides risk estimates for the significant routes of exposure at LHAAP-18/24. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a hypothetical future maintenance worker's exposure to soil and groundwater, as well as the toxicity of the chemicals of concern. The total risk from exposure to contaminated soil and groundwater at this site is estimated to be 4.4×10^{-01}. A risk below 1×10^{-4} is generally considered to be acceptable (USEPA, 1989). The total groundwater risk is unacceptable.

Table 2-5. Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Target End-point	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Ground-water	Ground-water	Ingestion or exposure through showering	*Explosive*					
			1,3,5-Trinitrobenzene		3.3E-01	NE	NE (Kp<=0.01)	3.3E-01
			Metals					
			Antimony		8.1E+00	NE	NE (Kp<=0.01)	8.1E+00
			Barium		8.4E-01	NE	NE (Kp<=0.01)	8.4E-01
			Chromium (total)		1.2E-01	NE	NE (Kp<=0.01)	1.2E-01
			Cobalt		1.4E-01	NE	NE (Kp<=0.01)	1.4E-01
			Manganese		1.7E+00	NE	NE (Kp<=0.01)	1.7E+00
			Nickel		4.7E+00	NE	NE (Kp<=0.01)	4.7E+00
			Silver		9.4E-01	NE	NE (Kp<=0.01)	9.4E-01
			Strontium		7.2E-02	NE	NE (Kp<=0.01)	7.2E-02
			Thallium		4.5E-01	NE	NE (Kp<=0.01)	4.5E-01
			Non-metallic Anions					
			Perchlorate		7.5E+02	NE	NE (Kp<=0.01)	7.5E+02
			Volatiles					
			Bromodichloromethane		3.4E-03	NTV	1.8E-03	5.2E-03
			Chloroform		2.7E-02	1.6E+01	1.1E-01	1.6E+01
			Cis-1,2-dichloroethene		2.4E-01	5.4E-02	NE (Kp<=0.01)	3.0E-01
			Methylene chloride		1.2E+03	4.2E+02	NE (Kp<=0.01)	1.6E+03
			Toluene		1.5E-04	1.3E-03	2.8E-05	1.5E-03
			Trichloroethene		3.4E+02	NTV	4.6E+02	8.0E+02
					Groundwater Hazard Index Total =			3.2E+03

Table 2-5. Risk Characterization Summary – Non-Carcinogens (continued)

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Target Endpoint	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil (0 to 0.5 feet)	Soil and particulates	Incidental ingestion, inhalation of particulates, dermal contact	*Metals*					
			Barium		3.9E-03	8.5E-05	3.6E-03	7.6E-03
			Mercury		3.6E-03	5.4E-07	3.3E-03	6.9E-03
			Thallium		2.6E-02	3.2E-06	1.7E-03	2.8E-02
							Soil Hazard Index Total =	4.2E-02
							Hazard Index Total (soil and groundwater) =	3.2E+03

Notes:

CNS	central nervous system
Kp	Dermal permeability coefficient
NE	Not evaluated through this exposure pathway. Chemical is not identified as a volatile.
NE (Kp<=0.01)	Based on USEPA Region 6 guidance, chemicals of potential concern with a Kp<=0.01 were not evaluated for dermal contact while showering (USEPA, 1995)
NTV	No toxicity value
TCDD	Tetrachlorodibenzo-p-dioxin
TEC	Toxicity equivalence concentration

References:

U.S. Environmental Protection Agency (USEPA), 1989, *Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual, (Part A)*, EPA/540/1-89/002, December.

Summary of Risk Characterization:

The table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure for LHAAP-18/24. The Risk Assessment Guidance for Superfund (USEPA, 1989) states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-carcinogenic effects. The estimated HI for groundwater is 3.2E+03 and for soil is 4.2E-02. These values \indicate that the potential for adverse non-carcinogenic effects could occur from exposure to groundwater.

Table 2-6. Chemicals Contributing to Carcinogenic Risk in Shallow Zone Groundwater

Chemical	ELCR [a]	EPC [a] (µg/L)	Well	Revised ELCR	Recent Maximum (µg/L)	Date	Well	MCL (µg/L)	TRRP PCL (µg/L)	Retained as a COC?
Methylene chloride	4.0×10^{-1}	7,300,000	MW-2	b	21,300	06/24/16	MW-2	5	—	Yes, 1
Trichloroethene	4.1×10^{-2}	210,000	MW-2	b	17,100	06/16/16	120	5	—	Yes, 1
2,3,7,8-TCDD	1.1×10^{-5}	530	95 UCL[d]	None More Recent				3.0×10^{-5}	—	No, 2
4,4'-DDD	1.3×10^{-6}	59	MW-2	None More Recent				—	3.8	No, 2
Tetrachloroethene[3]	—	—	—	—	85.1	06/24/16	MW-2	5	—	Yes, 1
Benzene[3]	—	—	—	—	< 62.6	06/24/16	MW-2	5	—	Yes, 1
1,1,2-Trichloroethane[3]	—	—	—	—	< 50	06/07/16	AWD1B	5	—	Yes, 1
Vinyl Chloride[3]	—	—	—	—	256	06/07/16	AWD-1	2	—	Yes, 1
1,4-Dioxane[3]	—	61.7	95 UCL[d]	—	412	06/07/16	MW-14	—	9.1	Yes, 1
Chloroform [d]	4.2×10^{-5}	28	95 UCL[d]	b	58.1	06/24/16	MW-2	—	240	No, 2, 4
Chemicals Retained on a Provisional Basis										
Bromodichloromethane [c]	2.3×10^{-6}	530	18WW09	b	< 125	06/24/16	MW-2	—	15	Yes, 1

Notes and Abbreviations:
1. Identified as a COC since EPC and/or Recent Results are above the MCL or PCL.
2. Combined Shallow Zone ELCR of Chemicals with no MCL is within acceptable range of 1×10^{-6} to 1×10^{-4}.
3. Included as contributing chemicals due to their frequency of detection above the MCL or PCL in recent sampling events.
4. Excluded as a COC as maximum concentration in the shallow zone is below MCL/PCL.

a. From Baseline Risk Assessment Table C-53 (Jacobs, 2002).
b. Revised ELCR not calculated for chemicals with an MCL.
c. All other wells were < 15 ug/L (the majority were below detection). Bromodichloromethane will be re-evaluated when data with lower reporting limit are obtained for MW-2.
d. Using ProUCL for the results of samples collected in June 2016.

95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

COC	contaminant of concern
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
TRRP PCL	Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level
MCL	maximum contaminant level from the Safe Drinking Water Act
µg/L	micrograms per liter
µg/L	micrograms per liter
COC	contaminant of concern
EPC	exposure point concentration
MCL	Safe Drinking Water Act maximum contaminant level

Table 2-7. Chemicals Contributing to Carcinogenic Risk in Wilcox Formation Groundwater

Chemical	Shallow Zone ELCR [a]	Shallow Zone EPC [a] (µg/L)	Shallow Zone Well	Recent Maximum in Wilcox Formation (µg/L)	Date	Well	MCL (µg/L)	TRRP PCL (µg/L)	Retained as a COC?
Methylene chloride	4.0×10^{-1}	7,300,000	MW-2	746	06/24/2016	18CPTMW01SW	5	—	Yes, 1
Trichloroethene	4.1×10^{-2}	210,000	MW-2	15,900	06/07/2016	MW-14B	5	—	Yes, 1
2,3,7,8-TCDD	1.1×10^{-5}	530	95 UCL	—	—		3.0×10^{-5}	—	No, 2
4,4'-DDD	1.3×10^{-6}	59	MW-2	—	—		—	3.8	No, 2
Benzene[3]	—	—	—	6.13	06/08/2016	18CPTMW03SW	5	—	Yes, 1
1,1,2-Trichloroethane[3]	—	—	—	0.858	06/15/2016	18CPTMW23	5	—	No, 5
Vinyl Chloride[3]	—	—	—	8.97	06/08/2016	18CPTMW08SW	2	—	Yes, 1
1,4-Dioxane[3]	—	61.7	95 UCL[c]	412	06/07/16	MW-14B	—	9.1	Yes, 1
Chloroform	4.2×10^{-5}	28	95 UCL	13.2	06/07/16	MW-14B	—	240	No, 2,5
Chemicals Retained on a Provisional Basis									
Tetrachloroethene	—	—	—	< 50	06/07/2016	MW-14B	5	—	Yes, 4
Bromodichloromethane[b]	2.3×10^{-6}	530	18WW09	< 40	06/07/16	MW-14B	—	15	Yes, 4

Notes and Abbreviations:

1. Identified as a COC since recent results are above the MCL or PCL and the compound is identified as a COC in the Shallow Zone.
2. Combined Shallow Zone ELCR of Chemicals with no MCL is within acceptable range of 1×10^{-6} to 1×10^{-4}.
3. Included as contributing chemicals due to their frequency of detection above the MCL or PCL in recent sampling events.
4. Identified as a COC due to high reporting limit in Wilcox Formation well(s) and presence in shallow zone groundwater. Retained on a provisional basis.
5. Excluded as a COC as maximum concentration in Wilcox Formation is below MCL/PCL.

a. From Baseline Risk Assessment Table C-53 (Jacobs, 2002).
b. All other wells were < 15 ug/L (the majority were below detection). Bromodichloromethane will be re-evaluated when data with lower reporting limit are obtained.
c. Using ProUCL for the results of samples collected in June 2016.

95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

COC	contaminant of concern
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
TRRP PCL	Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level
MCL	maximum contaminant level from the Safe Drinking Water Act
µg/L	micrograms per liter
B	Sample collected from the bottom of well screen

Table 2-8 Chemicals with Hazard Quotient Greater than 0.1 in Shallow Zone Groundwater

Chemical	HQ	EPC [a] (µg/L)	Well	Revised HQ	Recent Maximum (µg/L)	Date	Well	MCL (µg/L)	TRRP PCL (µg/L)	Retained as a COC?
Methylene chloride	1600	7,300,000	MW-2	b	21,300	06/24/16	MW-2	5	—	Yes, 1
Trichloroethene	800	210,000	MW-2	b	17,100	06/16/16	120	5	—	Yes, 1
Perchlorate	750	69,000	18WW17	2,500	82,900	06/21/16	18WW17	—	17	Yes, 2
Chloroform	16	28	95 UCL[d]	b	58.1	06/24/16	MW-2	—	240	No, 5
cis-1,2-Dichloroethene	0.3	250	95 UCL[d]	b	43,600	06/24/16	MW-2	70	—	Yes, 1
1,4-Dioxane[6]	—	61.7	95 UCL[d]	—	220	06/16/16	120	—	9.1	Yes, 1
Antimony	8.1	333	95 UCL[d]	b	1.49	06/17/16	MW-16	6	—	No, 5
Barium	0.84	6,000	MW-1	b	10,300	06/13/16	18CPTMW24	2,000	—	Yes, 1
Chromium	0.12	18,000	MW-1	b	4,620	06/16/16	18WW16	100	—	Yes, 1
Manganese	1.7	8,270	MW-1	1.1	5,290	06/29/16	18WW25	—	1,100*	No, 7
Nickel	4.7	9,600	MW-1	7.0	14,300	06/16/16	18WW16	—	490	Yes, 3
Silver	0.94	480	MW-1	< 0.002	< 1	June 2016	All wells	—	120	No, 4
Thallium	0.47	3.7	MW-2	b	0.821	06/17/16	109	2	—	No, 5
Chemicals Retained on a Provisional Basis										
Arsenic[6]	—	—	—	—	16.1	06/21/16 06/13/16	18CPTMW18 18CPTMW24	10	—	Yes, 1
Cobalt	0.14	280	MW-1	0.178	355	06/16/16	18WW16	—	240	Yes, 1
1,3,5-Trinitrobenzene	0.33	1,000	MW-2	No Recent Data				—	730	Yes, 3

Notes and Abbreviations:

1. Identified as a COC since EPC and/or Recent Results are above the MCL or PCL.
2. Identified as COC since hazard quotient (HQ) is > 0.1 and EPC and recent results are above the TRRP PCL.
3. Retained as a COC since revised HQ > 0.1 and sum of HQs may exceed 1.0.
4. Excluded since Revised HQ < 0. 1 using recent maximum concentration and chemical concentration is < PCL.
5. Excluded since Recent results are all less than the MCL or PCL, and pattern of detections does not indicate association with site contamination.
6. Included as contributing chemicals due to their frequency of detection above the MCL or PCL in recent sampling events (see Table 2-3).
7. Excluded because maximum concentrations of recent results are below the background 95%UTL.

a. From Baseline Risk Assessment Table C-50 (Jacobs, 2002).
b. Revised HQ not calculated for chemicals with an MCL or PCL.
c. Using ProUCL for the results of samples collected in June 2016

Table 2-8. Chemicals with Hazard Quotient Greater than 0.1 in Shallow Zone Groundwater (continued)

Notes and Abbreviations: (cont'd.)
95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

COC	contaminant of concern
EPC	exposure point concentration
HQ	hazard quotient
MCL	maximum contaminant level from the Safe Drinking Water Act
ND	non detect
TRRP PCL	Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level
UCL	upper confidence limit
µg/L	micrograms per liter

* 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL thus the background value will be considered the Cleanup Level for Manganese.

Table 2-9. Chemicals with Hazard Quotient Greater than 0.1 in Wilcox Formation Groundwater

Chemical	SZ HQ[a]	SZ EPCz[a] (µg/L)	SZ Well	Revised Wilcox Frmn HQ	Recent Wilcox Frmn Maximum (µg/L)	Date	Well	MCL (µg/L)	TRRP PCL (µg/L)	Retained as a COC?
Methylene chloride	1600	7,300,000	MW-2	0.16	746	06/24/2016	18CPTMW01SW	5		Yes, 1
Trichloroethene	800	210,000	MW-2	61	15,900	06/07/2016	MW-14B	5		Yes, 1
Perchlorate	750	69,000	18WW17	2,490	229,000	06/07/16	MW-14B		17	Yes, 1
Chloroform	16	28	95 UCL	7.5	13.2	06/07/16	MW-14B		240	No, 5
cis-1,2-Dichloroethene	0.3	250	95 UCL	3.1	2,600	06/07/16	MW-14T	70		Yes, 1
1,4-Dioxane[6]	—	102.4	95 UCL[b]	—	412	06/07/16	MW-14B	—	9.1	Yes, 1
Antimony	8.1	333	95 UCL[b]	<0.00002	<0.001	June 2016	All Wells	6		No, 4
Arsenic[6]	—	—	—	c	17.3	06/24/16	18CPTMW01SW	10		Yes, 1
Barium	0.84	6,000	MW-1	0.22	1,560	06/14/14	C-03	2,000		Yes, 3
Chromium	0.12	18,000	MW-1	0.000063	9.5	06/14/16	18CPTMW04SW	100		No, 4
Cobalt	0.14	280	MW-1	0.005	9.64	06/24/16	18CPTMW12SW		240	No, 4
Manganese	1.7	8,270	MW-1	0.38	1,850	06/14/16	C-03		1,100*	No, 6
Nickel	4.7	9,600	MW-1	0.0036	7.44 J	06/24/16	18CPTMW12SW		490	No, 4
Silver	0.94	480	MW-1	< 0.002	< 1	June 2016	All Wells		120	No, 4
Thallium	0.47	3.7	MW-2	< 0.025	< 0.200	June 2016	All Wells	2		No, 4
Chemicals Retained on a Provisional Basis										
1,3,5-Trinitrobenzene	0.33	1,000	MW-2		No Recent Data				730	Yes, 2

Notes and Abbreviations:

1. Identified as a COC since Recent Results are above the MCL or PCL.
2. Identified as COC since Shallow Zone hazard quotient (HQ) is > 0.1 and no recent data available.
3. Retained as a COC since Revised Wilcox Formation HQ > 0.1 and sum of HQs may exceed 1.0.
4. Excluded since Revised Wilcox Formation HQ < 0. 1 using recent maximum concentration and chemical concentration is < PCL.
5. Excluded as a COC as maximum concentration in Wilcox Formation is below MCL/PCL., and pattern of detections does not indicate association with site contamination.
6. Excluded because maximum concentrations of recent results are below the background 95%UTL.

a. From Baseline Risk Assessment Table C-50 (Jacobs, 2002).
b. Using ProUCL for the results of samples collected in June 2016.

Table 2-9. Chemicals with Hazard Quotient Greater than 0.1 in Wilcox Formation Groundwater (continued)

Notes and Abbreviations: (cont'd.)
95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

SZ	shallow zone
COC	contaminant of concern
EPC	exposure point concentration
HQ	hazard quotient
MCL	maximum contaminant level from the Safe Drinking Water Act
UCL	upper confidence limit
TRRP PCL	Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level
µg/L	micrograms per liter
B	Sample collected from the bottom of well screen
T	Sample collected from top of well screen

* 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Residential Groundwater PCL thus the background value will be considered the Cleanup Level for Manganese.

Table 2-10. Cleanup Levels at LHAAP-18/24

Medium	Chemical of Concern	Cleanup Level
Shallow Zone Groundwater		MCL (µg/L)
	Methylene chloride	5
	Trichloroethylene	5
	cis-1,2-Dichloroethene*	70
	Tetrachloroethene	5
	Benzene	5
	1,1,2-Trichloroethane	5
	Vinyl chloride*	2
	Arsenic	10
	Barium	2,000
	Chromium	100
		TRRP $^{GW}GW_{Ing}$ PCL (µg/L)
	Bromodichloromethane	15
	1,3,5-trinitrobenzene	730
	1,4-Dioxane	9.1
	Cobalt	240
	Nickel	490
	Perchlorate	17
Wilcox Formation Groundwater		MCL (µg/L)
	Methylene chloride	5
	Trichloroethylene	5
	cis-1,2-Dichloroethene*	70
	Tetrachloroethene	5
	Benzene	5
	Vinyl chloride*	2
	Arsenic	10
	Barium	2,000
		TRRP $^{GW}GW_{Ing}$ PCL (µg/L)
	Bromodichloromethane	15
	1,3,5-trinitrobenzene	730
	1,4-Dioxane	9.1
	Perchlorate	17
Soil		GWP-Ind (mg/kg)
	Methylene Chloride[1]	0.5
	Trichloroethylene	0.5
	Perchlorate	7.2
	Tetrachloroethene	0.5

Notes:
* Trichloroethene daughter products
**TRRP $^{GW}GW_{Ing}$ PCL from April 2018, https://www.tceq.texas.gov/remediation/trrp/trrppcls.html
GWP-Ind MSC Texas Commission on Environmental Quality soil medium-specific concentration (MSC) for industrial use based on groundwater protection
µg/L micrograms per liter
MCL Safe Drinking Water Act (SDWA) maximum contaminant level
mg/kg milligrams per kilogram
MSC medium-specific concentration

Table 2-11. Comparative Analysis of Alternatives

Criteria	No Action	Alternative 2 Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, LUC.	Alternative 3 Containment, Groundwater Extraction and Treatment, MNA, LUC	Alternative 4 Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, Enhanced DNAPL Removal by Surfactant Flushing, LUC	Alternative 5 Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, Enhanced DNAPL Removal by Thermal Treatment, LUC	Alternative 6 Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, Enhanced DNAPL Removal by Application of ZVI, LUC
Overall protection of human health and the environment	No protection. Does not achieve RAOs.	Achieves RAOs but over a very long time. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.	Achieves RAO for protecting human health by preventing exposure to contaminated groundwater. RAO for restoration of groundwater within the slurry wall area is not achieved within a reasonable time. Protection of human health and environment provided by physical containment of groundwater, and maintenance of LUC. MNA to treat areas outside slurry well and in Wilcox Formation. LTM to verify progress and containment.	Achieves RAOs. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.	Achieves RAOs. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.	Achieves RAOs. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.
Compliance with ARARs	No compliance with chemical-specific ARARs.	Complies with all ARARs.	Will require an ARAR waiver for groundwater inside the slurry wall.	Complies with all ARARs.	Complies with all ARARs.	Complies with all ARARs.
Long-term effectiveness and permanence	Is not effective at protection of human health and the environment and does not provide permanence.	Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants though effectiveness is limited and progress slow. LUC would be effective and reliable so long as they are maintained and enforced.	Containment would be permanent and effective so long as the slurry wall and hydraulic control are maintained. LUC would be effective and reliable so long as they are maintained and enforced.	Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants although small amounts of residual DNAPL would remain in low permeability zones. LUC would be effective and reliable so long as they are maintained and enforced.	Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants. LUC would be effective and reliable so long as they are maintained and enforced.	Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants although small amounts of residual DNAPL would remain in low permeability zones. LUC would be effective and reliable so long as they are maintained and enforced.
Reduction of toxicity, mobility, or volume through treatment	No reduction outside of natural processes.	Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.	Very limited reduction of toxicity and volume with no treatment of source areas. Reduced mobility within slurry wall.	Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.	Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.	Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.
Short-term effectiveness	No short-term impacts.	Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration several hundred years.	Potential for impacts to the community through increased construction activity. Some potential for impacts to workers during construction of slurry wall. Outside slurry wall area COC removal estimated ≤ 20 years. Duration inside containment > 500 years.	Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration 30+ years.	Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration ≤ 20 years.	Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration ≤ 30 years.
Implementability	Technically implementable; administratively unacceptable.	Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Extraction and treatment of groundwater is already implemented at the site. The effectiveness of extraction on DNAPL source removal is limited and controlled by the dissolution rate of DNAPL.	Implementable, but uncertainty exists in the effectiveness of slurry wall containment. Uncertain overall duration and cleanup levels possibly not attainable inside slurry wall.	Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Injection of surfactants uses similar tools as in situ bioremediation. Dual phase extraction is an established technology.	Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Thermal treatment is a commercially available technology but planning well in advance is required.	Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Injection of ZVI uses similar tools as in situ bioremediation.
*Costs						
Capital	$0	$10,600,000	$6,410,000	$13,110,000	$19,520,000	$102,230,000
O&M	$0	$19,600,000	$12,240,000	$19,390,000	$13,150,000	$19,390,000
Total	$0	$30,200,000	$18,650,000	$32,500,000	$32,670,000	$121,620,000
State Acceptance	This criterion will be evaluated in the Proposed Plan after state agency comments are provided					
Community Acceptance	This criterion will be evaluated in the Proposed Plan after community comments are provided					

Table 2-12. Remediation Cost Table Selected Remedy (Alternative 5) Present Worth Analysis

Year	Capital Costs	O&M Costs				Present Value (NPV)	
		Monitoring	GWTP	5-Yr Review	Total	Discount Rate Capital 3.0%	O&M
	Fees, Workplan, Documentation, Reactivate						
	ICT 3 and 9, Soil Excavation, New GWTP,						
1	$17,441,249 ERH, EISB - 1st Event	$646,751	$534,987		$1,181,738	NPV $19,520,000	$13,150,000
2		$646,751	$551,037		$1,197,787	Total Capital and O&M	$32,670,000
3	$1,768,144 EISB - 2nd event	$323,084	$567,568		$890,652		
4		$323,084	$584,595		$907,679		
5		$323,084	$602,133	$40,983	$966,200		
6		$166,045	$620,197		$786,242		
7		$166,045	$638,803		$804,848		
8		$166,045	$657,967		$824,012		
9		$166,045	$677,706		$843,751		
10	$326,379 Major Equipment Replacement	$166,045	$698,037	$40,983	$905,065		
11			$575,183		$575,183		
12		$166,045	$592,438		$758,483		
13			$610,211		$610,211		
14		$166,045	$628,517		$794,562		
15	$336,171 Major Equipment Replacement		$647,373	$40,983	$688,356		
16		$166,045	$666,794		$832,839		
17			$686,798		$686,798		
18		$166,045	$707,402		$873,447		
19			$728,624		$728,624		
20		$166,045	$750,483	$40,983	$957,511		
21					$0		
22		$166,045			$166,045		
23					$0		
24		$166,045			$166,045		
25				$32,787	$32,787		
26		$166,045			$166,045		
27					$0		
28		$166,045			$166,045		
29					$0		
30		$166,045		$32,787	$198,832		
	$19,871,943	$4,753,426	$12,726,853	$229,507	$17,709,787		

Table 2-13. Description of ARARs for Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Soil		
TCEQ Texas Risk Reduction Rules 30 TAC 335.558 and 335.559(g)(2)	Ensures adequate protection of human health and the environment from potential exposure to contaminants associated with releases – **relevant and appropriate** for remediation of contaminated soil for cross-media contamination pathways such as soil to groundwater and for hypothetical future maintenance workers.	Near surface (i.e., 0-2 feet bgs) non-residential (industrial) soils shall conform to the non-residential soil MSCs (SAI-Ind) based upon worker ingestion of soil, inhalation of particulates and volatiles and the non-residential soil-to-groundwater cross media protection concentration. The concentration of contamination in soil shall not exceed the non-residential soil-to-groundwater protection MSC (GWP-Ind). See Table 2-10 for specific numeric criteria.
Groundwater		
Federal Safe Drinking Water Act (SDWA) MCLs 40 C.F.R. §§ 141.61 and 141.62	Applicable to drinking water for a public water system—**relevant and appropriate** for water that could potentially be used for human consumption.	Must not exceed SDWA MCLs for water designated as a current or potential source of drinking water. The MCLs for organic contaminants MC, TCE, PCE, cis-1,2-DCE, benzene, 1,1,2-TCA and VC are provided in 40 C.F.R. § 141.61(a) and the MCLs for inorganic contaminants arsenic, barium and chromium are provided in 40 C.F.R. § 141.62 (b) and Table 2-10 of this report.
Surface Water		
Texas Surface Water Quality Criteria (30 TAC §307.6(d)(1))	Applicable to chemicals in surface water (Harrison Bayou) for water that could potentially be used for human consumption.	Chemicals must not exceed the Texas surface water quality standards in waters of the Harrison Bayou. The surface water quality standards for MC, TCE, PCE, Benzene, 1,1,2-TCA and VC are provided in 30 TAC §307.6(d)(1).
Texas Surface Water Quality Criteria (30 TAC §307.6(d)(1))	Applicable to industrial groundwater—**relevant and appropriate** to meet Texas surface water quality criteria	Interim Record of Decision effluent discharge limits. The discharge criteria (Table 2-14) for the COCs will be re-evaluated based on most current TCEQ standards
General Site Preparation, Construction, and Excavation Activities		
Opacity Standard 30 TAC 111.111(a)(8)(A)	Fugitive emissions from land-disturbing activities (e.g., excavation, construction)—**applicable**.	Visible emissions shall not be permitted to exceed opacity of 30% for any 6-minute period from any source.
Fugitive Particulate Matter Standard 30 TAC 111.145	Fugitive emissions from land-disturbing activities (e.g., excavation, construction)—**applicable**.	No person may cause, suffer, allow, or permit a structure, road, street, alley or parking area to be constructed, altered, repaired, or demolished, or land to be cleared without taking at least the following precautions to achieve control of dust emissions: • Use of water or of suitable oil or chemicals for control of dust in the demolition of structures, in construction operations, in work performed on a road, street, alley, or parking area, or in the clearing of land; and • Use of adequate methods to prevent airborne particulate matter during sandblasting of structures or similar operations

Table 2-13. Description of ARARs for Selected Remedy (continued)

Citation	Activity or Prerequisite/Status	Requirement
Storm Water Runoff Controls 40 C.F.R. § 122.26	Storm water discharges associated with construction activities—**applicable** to disturbances of equal to or greater than 1 acre of land.	Specific to areas of excavation of contaminated soil. Good construction management techniques, phasing of construction projects, minimal clearing, and sediment, erosion, structural, and vegetative controls shall be implemented to mitigate storm water run-on/runoff.
Air Contaminants – General Nuisance Rules 30 TAC 101.4	Emissions of air contaminants—**applicable**.	No person shall discharge from any source whatsoever one or more air contaminants or combinations thereof, in such concentration and of such duration as are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property.
Waste Generation, Management, and Storage		
Characterization of Solid Waste 40 C.F.R. § 262.11 30 TAC 335.62 30 TAC 335.504 30 TAC 335.503(a)(4)	Generation of solid waste, as defined in 30 TAC 335.1—**applicable**.	Must determine whether the generated solid waste is RCRA hazardous waste by using prescribed testing methods or applying generator knowledge based on information regarding material or process used. If the waste is determined to be hazardous, it must be managed in accordance with 40 C.F.R. § 262–268. After making the hazardous waste determination as required, if the waste is determined to be nonhazardous, the generator shall then classify the waste as Class 1, Class 2, or Class 3 (as defined in Section 335.505 through Section 335.507) using one or more of the methods listed in Section 335.503(a)(4) and Section 335.508 and manage the waste in accordance with the requirements of Chapter 335 of the TAC for industrial solid waste.
Requirements for Temporary Storage of Hazardous Waste in Accumulation Areas 40 C.F.R. § 262.34(a) and (c)(1) 30 TAC 335.69(a) and (d)	On-site accumulation of 55 gallons or less of RCRA hazardous waste for 90 days or less at or near the point of generation—**applicable** if hazardous waste is generated (e.g., PPE) and stored in an accumulation area.	Remedial activities derived waste (from monitoring and treating contaminated groundwater) is expected for this facility. A generator may accumulate hazardous waste at the facility provided that • Waste is placed in containers that comply with 40 C.F.R. § 264.171 to 264.173 (Subpart I); and • Container is marked with the words “hazardous waste”; or • Container may be marked with other words that identify the contents.
Characterization of Hazardous Waste 40 C.F.R. § 264.13(a)(1); 40 C.F.R. § 268.7 30 TAC 335.504(3) 30 TAC 335.509 30 TAC 335.511	Generation of a RCRA hazardous waste for treatment, storage, or disposal—**applicable if hazardous waste is generated** (e.g., PPE).	Must obtain a detailed chemical and physical analysis of a representative sample of the waste(s) that at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with 40 C.F.R. § 264 and 268. Must also determine whether the waste is restricted from land disposal under 40 C.F.R. § 268 et seq. by testing in accordance with prescribed methods or use of generator knowledge of waste.

Table 2-13. Description of ARARs for Selected Remedy (continued)

Citation	Activity or Prerequisite/Status	Requirement
Requirements for the Use and Management of Containers 40 C.F.R. § 264.171–264.173 30 TAC 335.69(e) 30 TAC 335.152(a)(7)	On-site storage/treatment of RCRA hazardous waste in containers for greater than 90 days—applicable if hazardous waste is generated (e.g., PPE) and is stored in containers.	Design and operating standards of 40 C.F.R. § 264.175(c) and 40 C.F.R. § 264.171, 264.172, and 264.173(a) and (b) must be met for the use and management of hazardous waste in containers.
Well Construction		
Well Construction Standards—Monitoring or Injection Wells 16 TAC 76.1000	Construction of water wells—applicable to construction of new monitoring or injection wells, if needed.	Injection wells shall be completed in accordance with the technical requirements of Section 76.1000, as appropriate. Substantive requirements applicable to the injection wells will be adhered to.
Well Construction Standards—Extraction Wells 16 TAC 76.1000(a) and (c) through (h) 16 TAC 76.1002(a) through (c) 16 TAC 76.1008(a) through (c)	Construction of water wells—applicable to construction of extraction (recovery) wells.	Substantive requirements applicable to extraction (recovery) wells will be adhered to. Wells shall be completed in accordance with the technical requirements of Section 76.1000, as appropriate. Water wells completed to produce undesirable water shall be cased to prevent the mixing of water or constituent zones. The annular space between the casing and the wall of the borehole shall be pressure grouted with cement or bentonite grout to the land surface. Bentonite grout may not be used if a water zone contains chloride water above 1500 parts per million (ppm) or if hydrocarbons are present. Wells producing undesirable water or constituents shall be completed in such a manner that will not allow undesirable fluids to flow onto the land surface. During installation of a water well pump, installer shall make a reasonable effort to maintain integrity of groundwater and to prevent contamination by elevating the pump column and fittings, or by other means suitable under the circumstances. Pump shall be constructed so that no unprotected openings into the interior of the pump or well casing exist.

Table 2-13. Description of ARARs for Selected Remedy (continued)

Citation	Activity or Prerequisite/Status	Requirement
Treatment/Disposal		
Disposal of Wastewater (e.g., contaminated groundwater, dewatering fluids, decontamination liquids) 40 C.F.R. § 268.1(c)(4)(i) 30 TAC 335.431(c)	RCRA-restricted characteristically hazardous waste intended for disposal—**applicable if extracted groundwater is determined to be RCRA characteristically hazardous.**	Disposal is not prohibited if such wastes are managed in a treatment system subject to regulation under Section 402 of the CWA that subsequently discharges to waters of the United States.
Closure		
Standards for Plugging Wells that Penetrate Undesirable Water or Constituent Zones 16 TAC 76.1004(a) through (c)	Plugging and abandonment of wells—**applicable to plugging and closure of monitoring and/or extraction wells.**	If a well is abandoned, all removable casing shall be removed and the entire well pressure filled via a tremie pipe with cement from bottom up to the land surface. In lieu of this procedure, the well shall be pressure-filled via a tremie tube with bentonite grout of a minimum 9.1 lb/gal weight followed by a cement plug extending from land surface to a depth of not less than 2 feet. Undesirable water or constituents or the freshwater zone(s) shall be isolated with cement plugs.
Post Closure Care Requirements for Hazardous Waste Landfills 40 CFR § 264.228(b)(1)(3)(4) 30 TAC § 335.174(b) 40 CFR §§ 264.117 - 264.120	Closure of a RCRA landfill – **relevant and appropriate** to closure or post closure under CERCLA of surface impoundments containing RCRA hazardous waste	Owner or operator must • Maintain the effectiveness and integrity of the final cover including making repairs to the cap as necessary to correct effects of settling, erosion, etc.; • Prevent run-on and runoff from eroding or otherwise damaging final cover; and • Maintain and monitor a groundwater monitoring system.

Abbreviations:

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CWA	Clean Water Act of 1972
GWP	Groundwater Protection
MCL	Maximum Contaminant Level
lb/gal	pound per gallon
%	percent
PCL	Texas Residential Groundwater Protective Concentration Level
PPE	personal protective equipment
ppm	part per million
RCRA	Resource Conservation and Recovery Act of 1976
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
USC	United States Code
USEPA	U.S. Environmental Protection Agency

Table 2-14. Current Effluent Limitations for the Discharge of Remediated Groundwater from the Groundwater Treatment Plant

Chemical	Units are (µg/L)		
	Daily Average Concentration	Daily Maximum Concentration	Reporting Limit
VOCs			
1,1,1-Trichloroethane	3,417	7,230	1
1,1,2-Trichloroethane	102.5	216.9	1
1,1-Dichloroethane	6,633	14,032	1
1,1-Dichloroethene	119	253	1
1,2-Dichloroethane	85	181	1
Acetone	1,132	2,395	2
Benzene	85	181	1
Carbon tetrachloride	85	181	1
Chlorobenzene	22,300	47,180	1
Chloroform	1,708	3,615	1
Ethylbenzene	26,954	57,025	1
m,p-xylenes	39.5	83.6	2
Methylene chloride (dichloromethane)	803	1,699	2
o-xylene	39.5	83.6	1
Styrene	2,829	5,987	1
Tetrachloroethene	85.4	180.7	1
Toluene	1,980	4,189	1
Trichloroethene	85	181	1
Vinyl chloride	34	72	1
Metals			
Barium (total)	1,000	2,000	4
Chromium (6+)	58	124	10
Lead (total)	2.2	4.6	2
Selenium (total)	5.7	12	2
Silver	1.4	3	2
Perchlorate			
Perchlorate	278	589	4
SVOCs			
1,4-Dioxane	NA	134.2	1

Table 2-14. Current Effluent Limitations for the Discharge of Remediated Groundwater from the Groundwater Treatment Plant (continued)

Chemical	Units are (µg/L)		
	Daily Average Concentration	Daily Maximum Concentration	Reporting Limit
Anions			
Chloride	NA	N/A	10,000
Sulfate	NA	N/A	10,000

<u>Notes</u>:

Daily average concentration – the arithmetic average of all effluent samples, composite or grab as required by this permit within a period of one calendar month, consisting of at least four separate representative measurements. When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values taken during the month shall be utilized as the daily average concentration.

Daily maximum concentration – the maximum concentration measured on a single day, by composite sample, unless otherwise specified elsewhere in the permit.

TAC reference – most of the limitations are based upon water quality standards found at TAC 307 for the protection of human health and aquatic life. The limit for barium is from TAC 319 – Subchapter B.

Reporting limit - the minimum analytical level. All testing must be completed utilizing USEPA approved methods which can detect the pollutant to the referenced concentration.

N/A – not applicable.

The allowable flow rate of GWTP effluent that can be discharged to Harrison Bayou is given by:

$$Q_E = \frac{C_C(Q_E + Q_S) - Q_S C_A}{C_E}$$

where Q_E = GWTP effluent flow

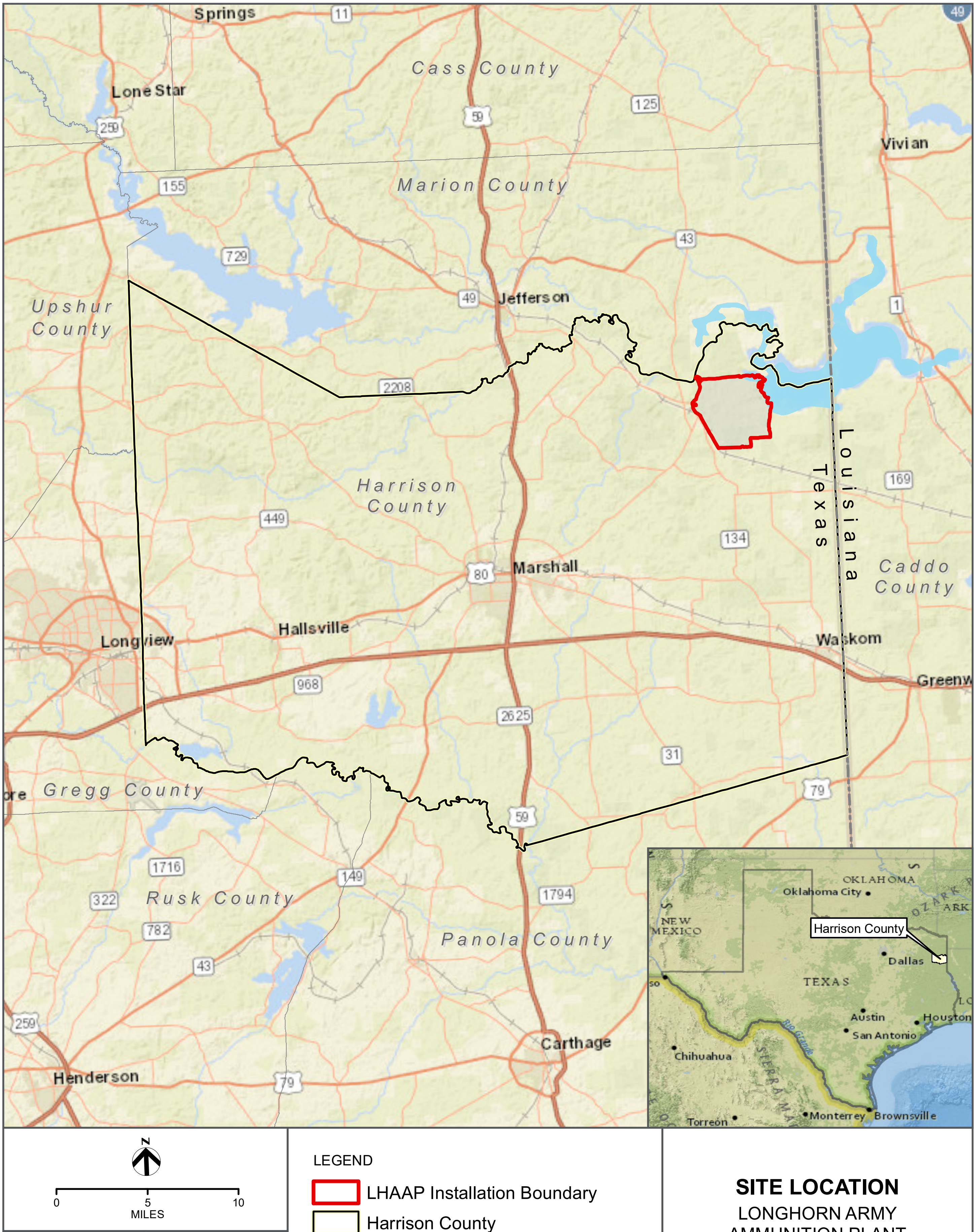
Q_S = Harrison Bayou flow

C_C = Criteria concentration (100 mg/L for chloride, 50 mg/L for sulfate)

C_A = Ambient concentration = 10 mg/L

C_E = Chloride or sulfate concentration in GWTP effluent

00954306



LEGEND

LHAAP Installation Boundary

Harrison County

State Boundary

SITE LOCATION

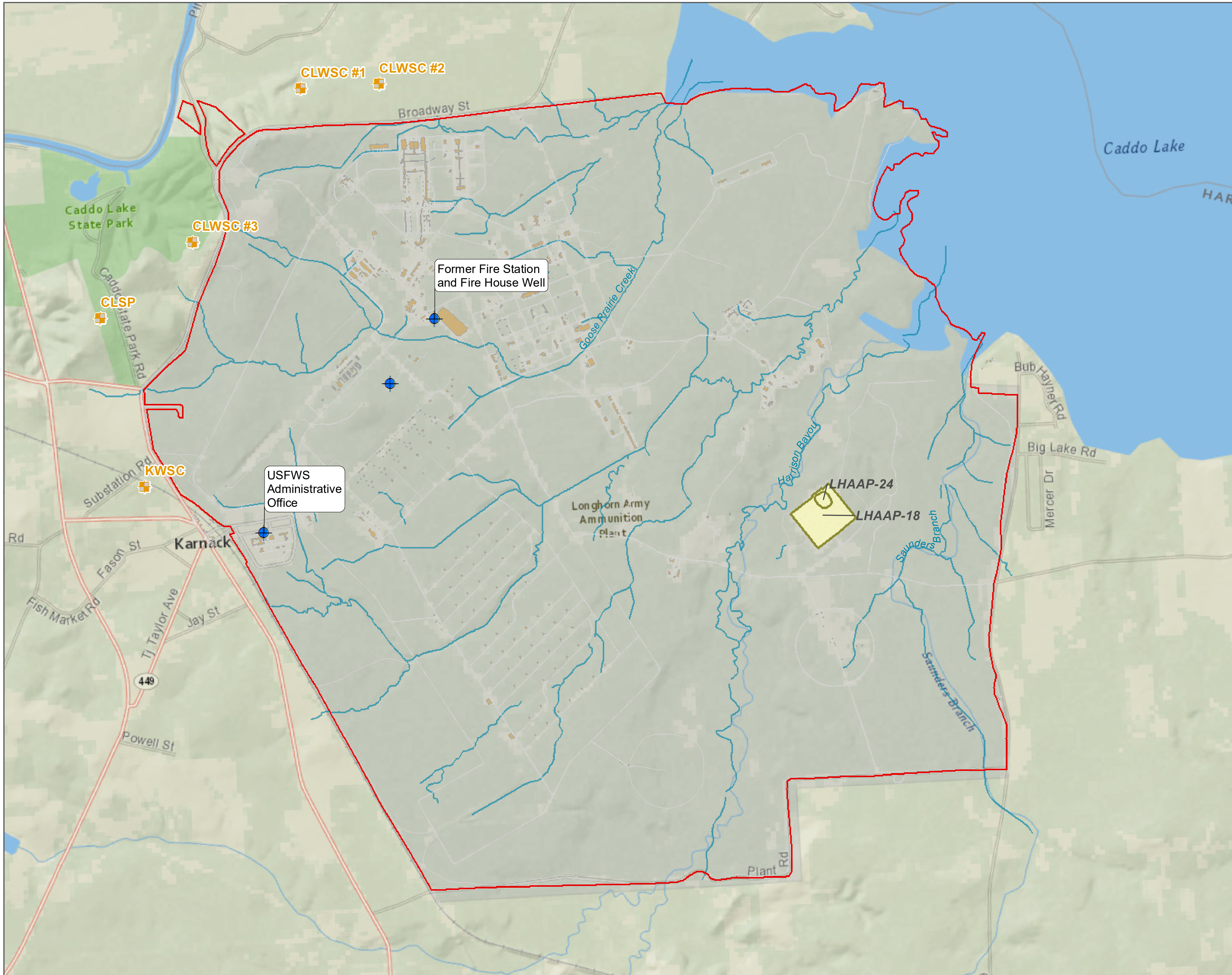
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

DATA SOURCES: AECOM, ESRI, LHAAP

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

FIGURE 2-1

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP29\LHAAP_29_ROD_LHAAP_SITE_LOCATION.MXD - USER: EBOWLIN - DATE: 7/24/2019



LEGEND
- Public Water Supply Well Locations
- Potable Water Wells
- Roads
- Building
- Site
- LHAAP Installation Boundary

CLWSC – Caddo Lake Water Supply Corporation
KWSC – Karnack Water Supply Corporation

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

SITE VICINTY

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

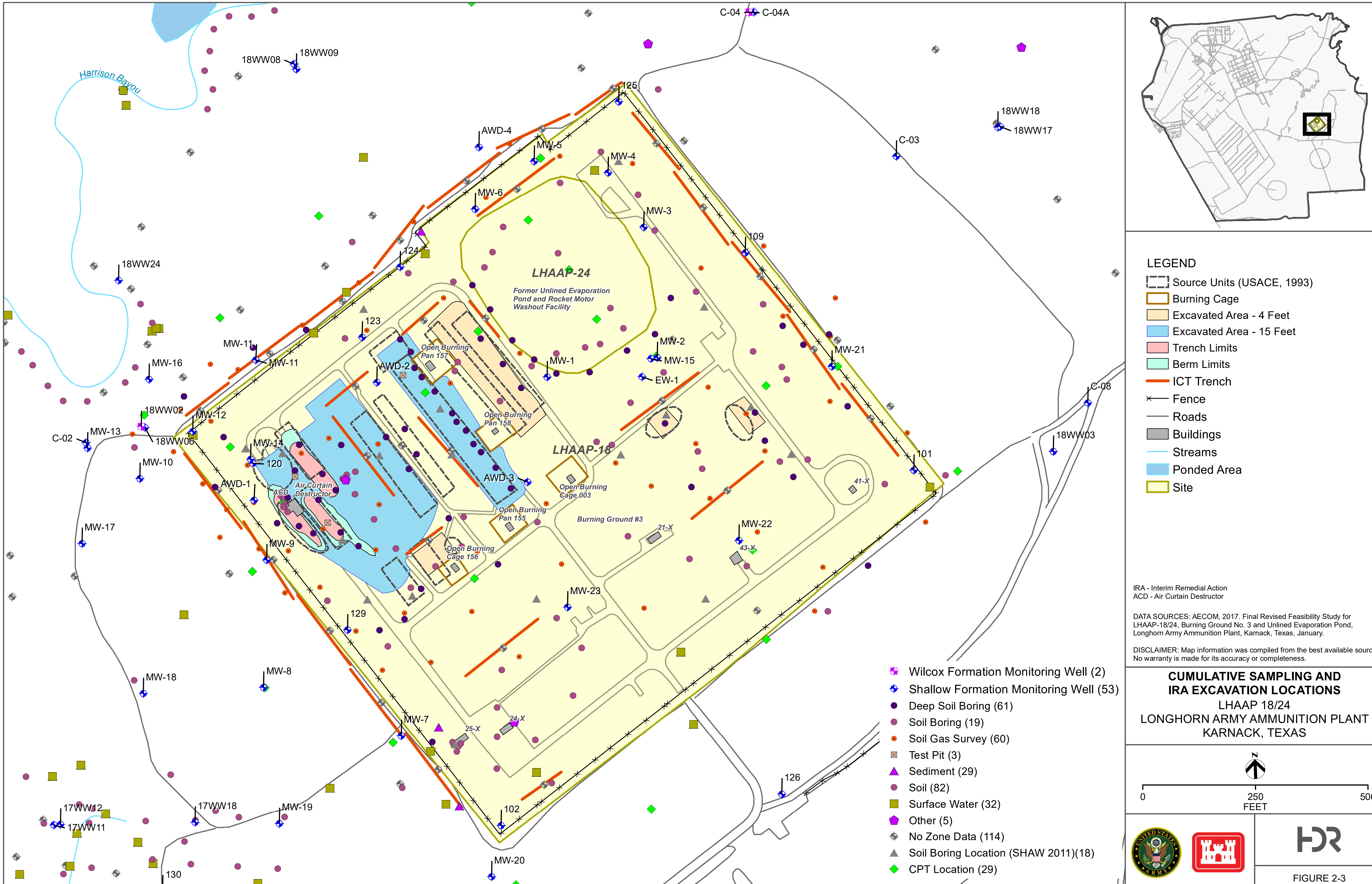
N

0 0.5 1
MILES

FIGURE 2-2

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_SITE_VICINTY.MXD - USER: KLOFGREN - DATE: 11/21/2019

00954308



CUMULATIVE SAMPLING AND IRA EXCAVATION LOCATIONS
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

FIGURE 2-3

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_SAMPLINGLOCATIONS_EXCAVATION_V2.MXD - USER: KLOFGREN - DATE: 12/26/2019

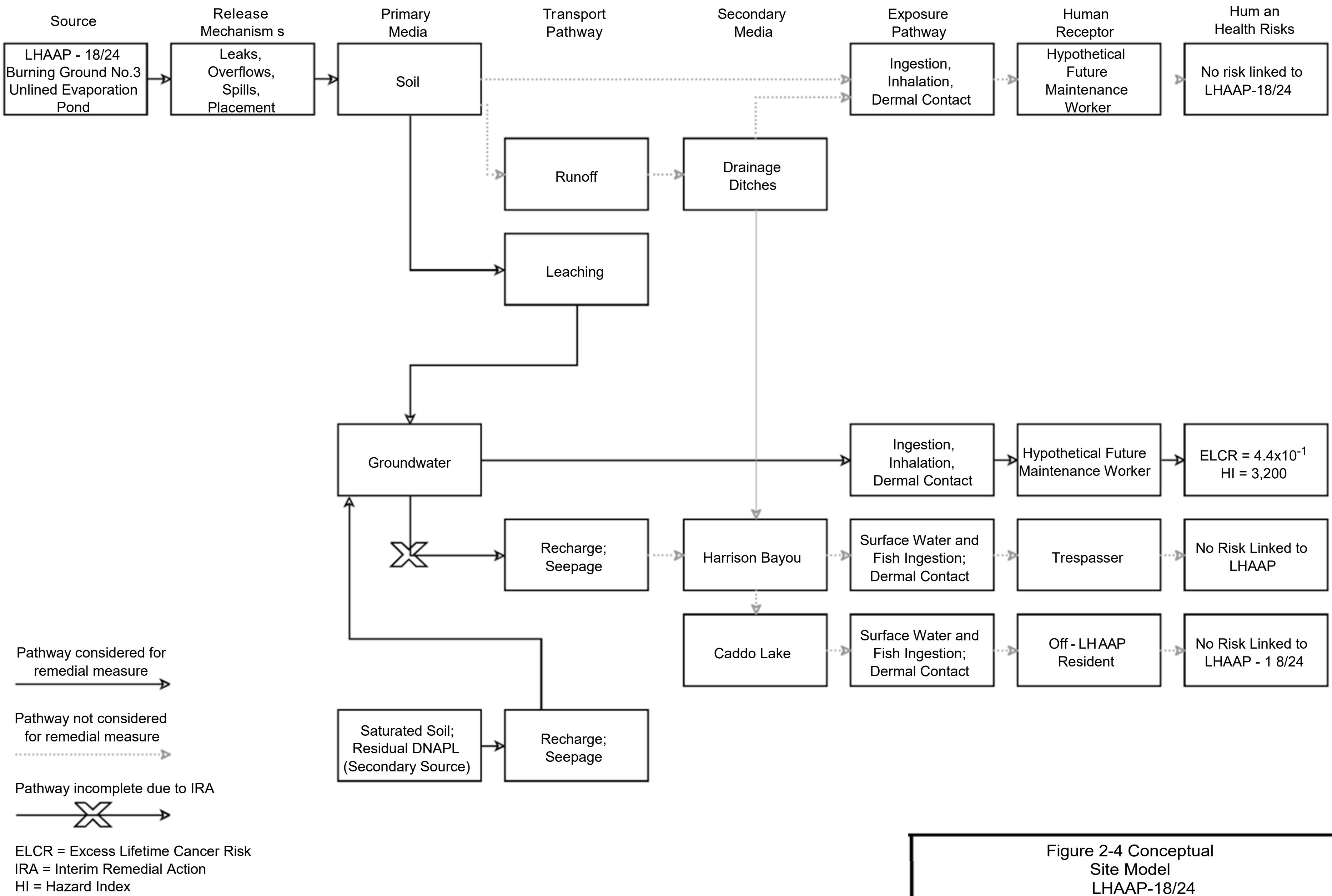
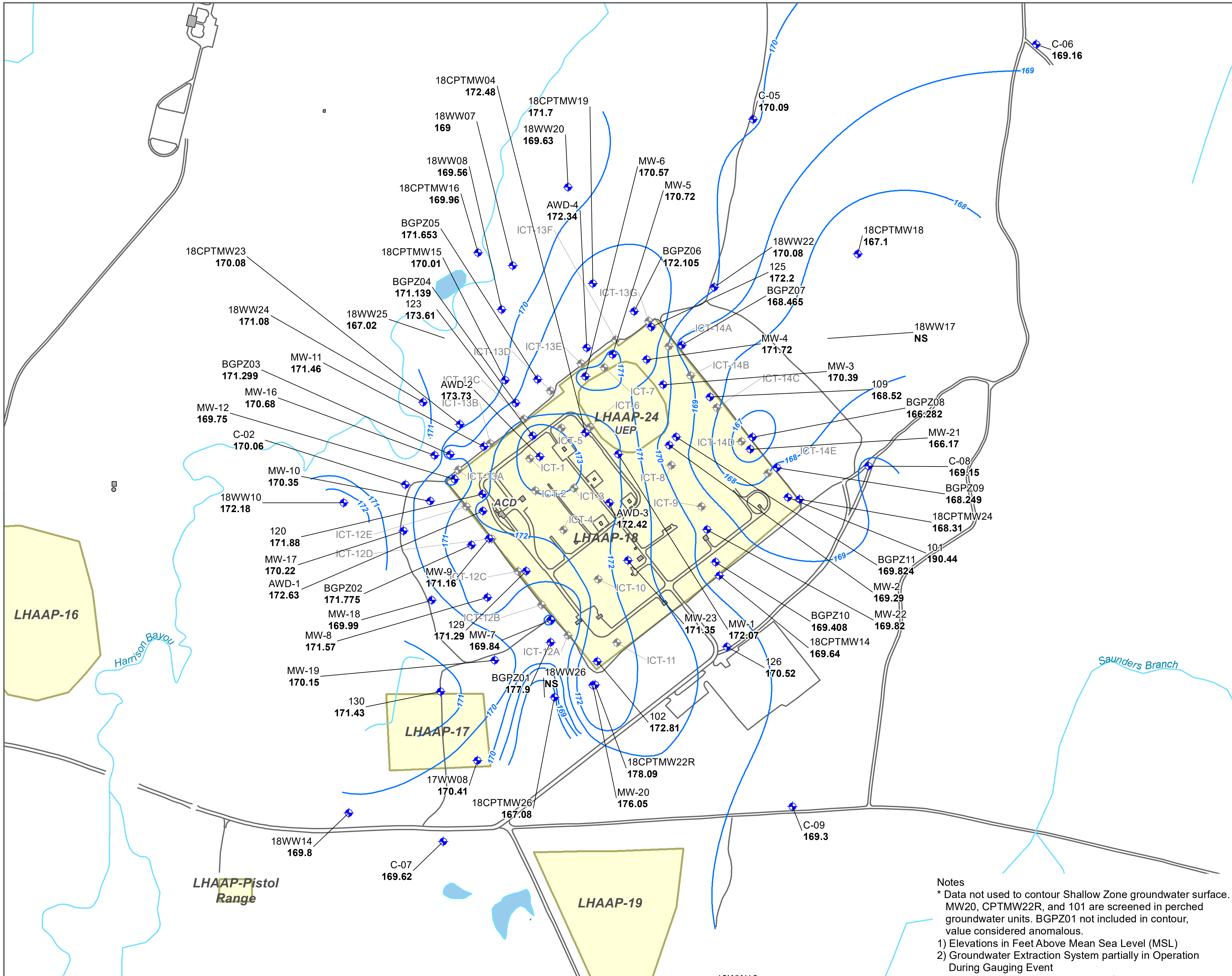


Figure 2-4 Conceptual Site Model LHAAP-18/24

Longhorn Army Ammunition Plant
Karnack, Texas

00954310



LEGEND

- Shallow Zone Monitoring Well
- ICT Extraction Location
- Groundwater Contour (dashed where inferred)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

Notes
* Data not used to contour Shallow Zone groundwater surface. MW20, CPTMW22R, and 101 are screened in perched groundwater units. BGPZ01 not included in contour, value considered anomalous.
1) Elevations in Feet Above Mean Sea Level (MSL)
2) Groundwater Extraction System partially in Operation During Gauging Event

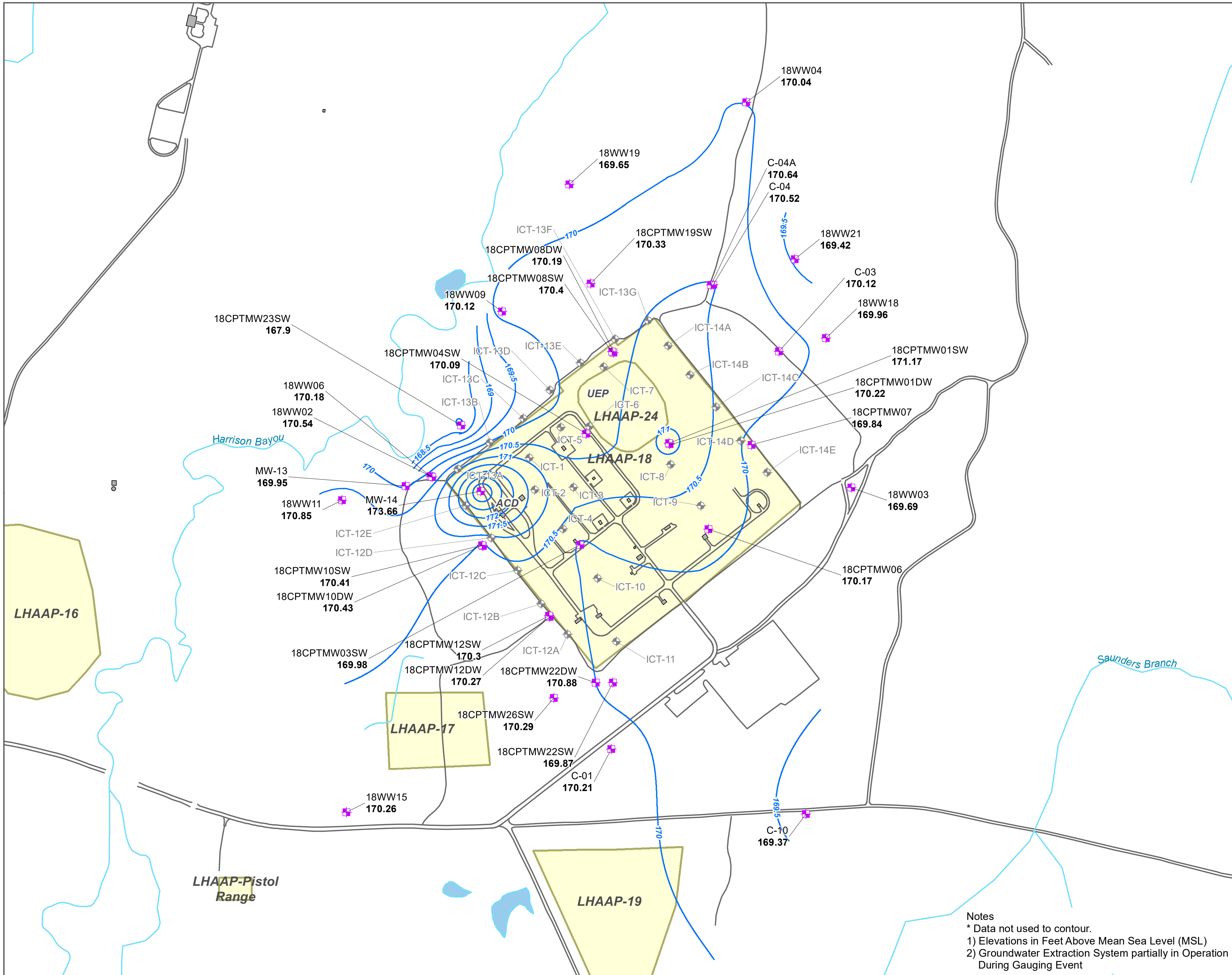
GROUNDWATER POTENTIOMETRIC SHALLOW ZONE (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

N
0 250 500
FEET

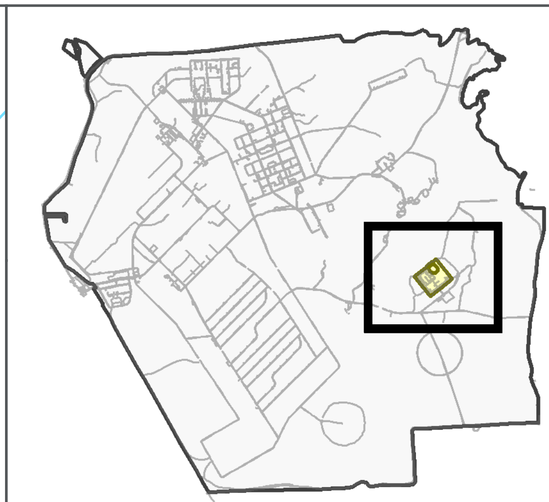
FDR

FIGURE 2-5

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GWE_SHALLOW_JUN_2016.MXD - USER: KLOFGREN - DATE: 12/19/2019



Notes
* Data not used to contour.
1) Elevations in Feet Above Mean Sea Level (MSL)
2) Groundwater Extraction System partially in Operation During Gauging Event



LEGEND

- Wilcox Formation Monitoring Well
- ICT Extraction Location
- Groundwater Contour (dashed where inferred)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

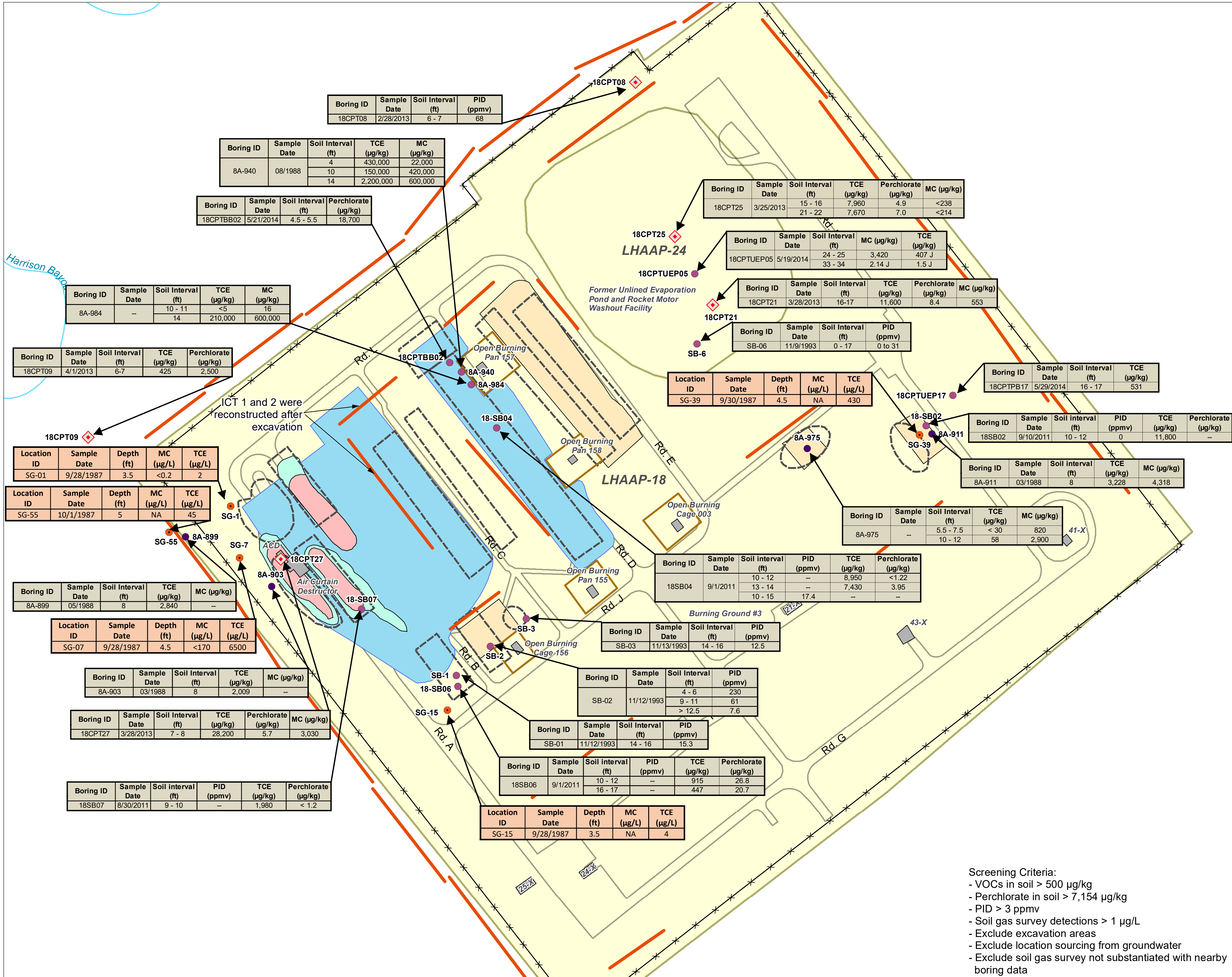
DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

GROUNDWATER POTENTIOMETRIC WILCOX FORMATION (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

N
0 250 500
FEET

FIGURE 2-6

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GWE_WILCOX_JUN_2016.MXD - USER: KLOFGREN - DATE: 12/19/2019



Boring ID	Sample Date	Soil Interval (ft)	PID (ppmv)
18CPT08	2/28/2013	6 - 7	68

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	MC (µg/kg)
8A-940	08/1988	4	430,000	22,000
		10	150,000	420,000
		14	2,200,000	600,000

Boring ID	Sample Date	Soil Interval (ft)	Perchlorate (µg/kg)
18CPTBB02	5/21/2014	4.5 - 5.5	18,700

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	MC (µg/kg)
8A-984	--	10 - 11	<5	16
		14	210,000	600,000

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	Perchlorate (µg/kg)
18CPT09	4/1/2013	6-7	425	2,500

Location ID	Sample Date	Depth (ft)	MC (µg/L)	TCE (µg/L)
SG-01	9/28/1987	3.5	<0.2	2

Location ID	Sample Date	Depth (ft)	MC (µg/L)	TCE (µg/L)
SG-55	10/1/1987	5	NA	45

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	MC (µg/kg)
8A-899	05/1988	8	2,840	--

Location ID	Sample Date	Depth (ft)	MC (µg/L)	TCE (µg/L)
SG-07	9/28/1987	4.5	<170	6500

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	MC (µg/kg)
8A-903	03/1988	8	2,009	--

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	Perchlorate (µg/kg)	MC (µg/kg)
18CPT27	3/28/2013	7 - 8	28,200	5.7	3,030

Boring ID	Sample Date	Soil interval (ft)	PID (ppmv)	TCE (µg/kg)	Perchlorate (µg/kg)
18SB07	8/30/2011	9 - 10	--	1,980	< 1.2

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	Perchlorate (µg/kg)	MC (µg/kg)
18CPT25	3/25/2013	15 - 16	7,960	4.9	<238
		21 - 22	7,670	7.0	<214

Boring ID	Sample Date	Soil Interval (ft)	MC (µg/kg)	TCE (µg/kg)
18CPTUEP05	5/19/2014	24 - 25	3,420	407 J
		33 - 34	2.14 J	1.5 J

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	Perchlorate (µg/kg)	MC (µg/kg)
18CPT21	3/28/2013	16-17	11,600	8.4	553

Boring ID	Sample Date	Soil Interval (ft)	PID (ppmv)
SB-06	11/9/1993	0 - 17	0 to 31

Location ID	Sample Date	Depth (ft)	MC (µg/L)	TCE (µg/L)
SG-39	9/30/1987	4.5	NA	430

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)
18CPTPB17	5/29/2014	16 - 17	531

Boring ID	Sample Date	Soil interval (ft)	PID (ppmv)	TCE (µg/kg)	Perchlorate (µg/kg)
18SB02	9/10/2011	10 - 12	0	11,800	--

Boring ID	Sample Date	Soil interval (ft)	TCE (µg/kg)	MC (µg/kg)
8A-911	03/1988	8	3,228	4,318

Boring ID	Sample Date	Soil Interval (ft)	TCE (µg/kg)	MC (µg/kg)
8A-975	--	5.5 - 7.5	< 30	820
		10 - 12	58	2,900

Boring ID	Sample Date	Soil interval (ft)	PID (ppmv)	TCE (µg/kg)	Perchlorate (µg/kg)
18SB04	9/1/2011	10 - 12	--	8,950	<1.22
		13 - 14	--	7,430	3.95
		10 - 15	17.4	--	--

Boring ID	Sample Date	Soil Interval (ft)	PID (ppmv)
SB-03	11/13/1993	14 - 16	12.5

Boring ID	Sample Date	Soil Interval (ft)	PID (ppmv)
SB-02	11/12/1993	4 - 6	230
		9 - 11	61
		> 12.5	7.6

Boring ID	Sample Date	Soil Interval (ft)	PID (ppmv)
SB-01	11/12/1993	14 - 16	15.3

Boring ID	Sample Date	Soil interval (ft)	PID (ppmv)	TCE (µg/kg)	Perchlorate (µg/kg)
18SB06	9/1/2011	10 - 12	--	915	26.8
		16 - 17	--	447	20.7

Location ID	Sample Date	Depth (ft)	MC (µg/L)	TCE (µg/L)
SG-15	9/28/1987	3.5	NA	4

Screening Criteria:
- VOCs in soil > 500 µg/kg
- Perchlorate in soil > 7,154 µg/kg
- PID > 3 ppmv
- Soil gas survey detections > 1 µg/L
- Exclude excavation areas
- Exclude location sourcing from groundwater
- Exclude soil gas survey not substantiated with nearby boring data

LEGEND
- Site
- Source Units (USACE, 1993)
- Burning Cage
- Excavated Area - 4 Feet
- Excavated Area - 15 Feet
- Trench Limits
- Berm Limits
- Soil Boring
- Deep Soil Boring
- Soil Gas Survey
- Test Pit
- CPT/MIP Location (AECOM, 2013)
- ICT Trench
- Fence

Soil Result

Boring ID	Sample Date	Soil Interval (ft)	PID (ppmv)
18CPT08	2/28/2013	6 - 7	68

Soil Gas Result

Location ID	Depth (ft)	MC (µg/L)	TCE (µg/L)
SG-15	3.5	NA	4

ACD – Air Curtain Destructor

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

RESULTS OF RECENT SOIL SAMPLING

LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

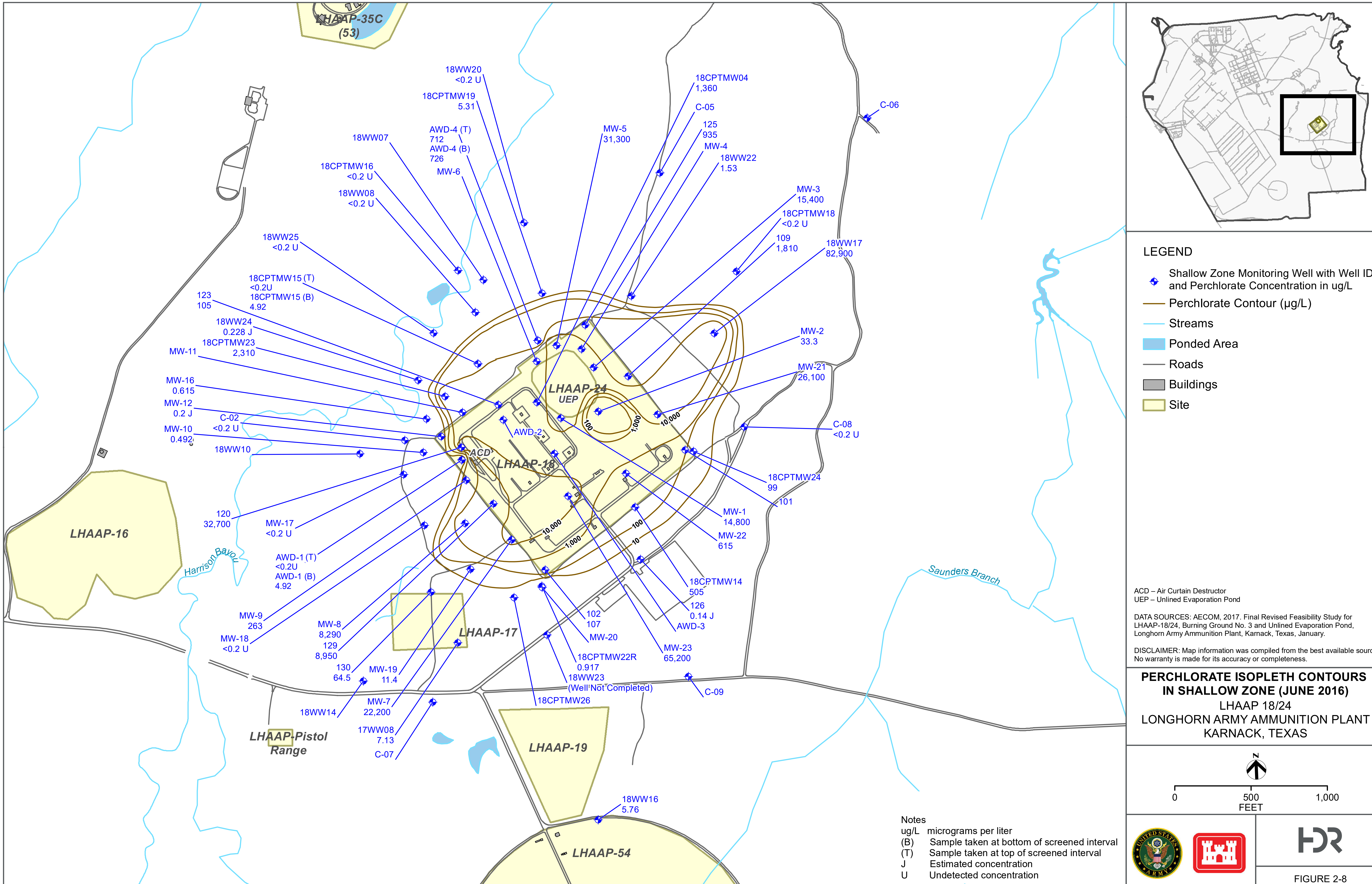
N

0 200 400
FEET

FIGURE 2-7

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_SOILCONTAMINATION_REMEDIATION.MXD - USER: KLOFGREN - DATE: 12/26/2019

00954313



LEGEND

- Shallow Zone Monitoring Well with Well ID and Perchlorate Concentration in ug/L
- Perchlorate Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

Notes
ug/L micrograms per liter
(B) Sample taken at bottom of screened interval
(T) Sample taken at top of screened interval
J Estimated concentration
U Undetected concentration

PERCHLORATE ISOPLETH CONTOURS IN SHALLOW ZONE (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

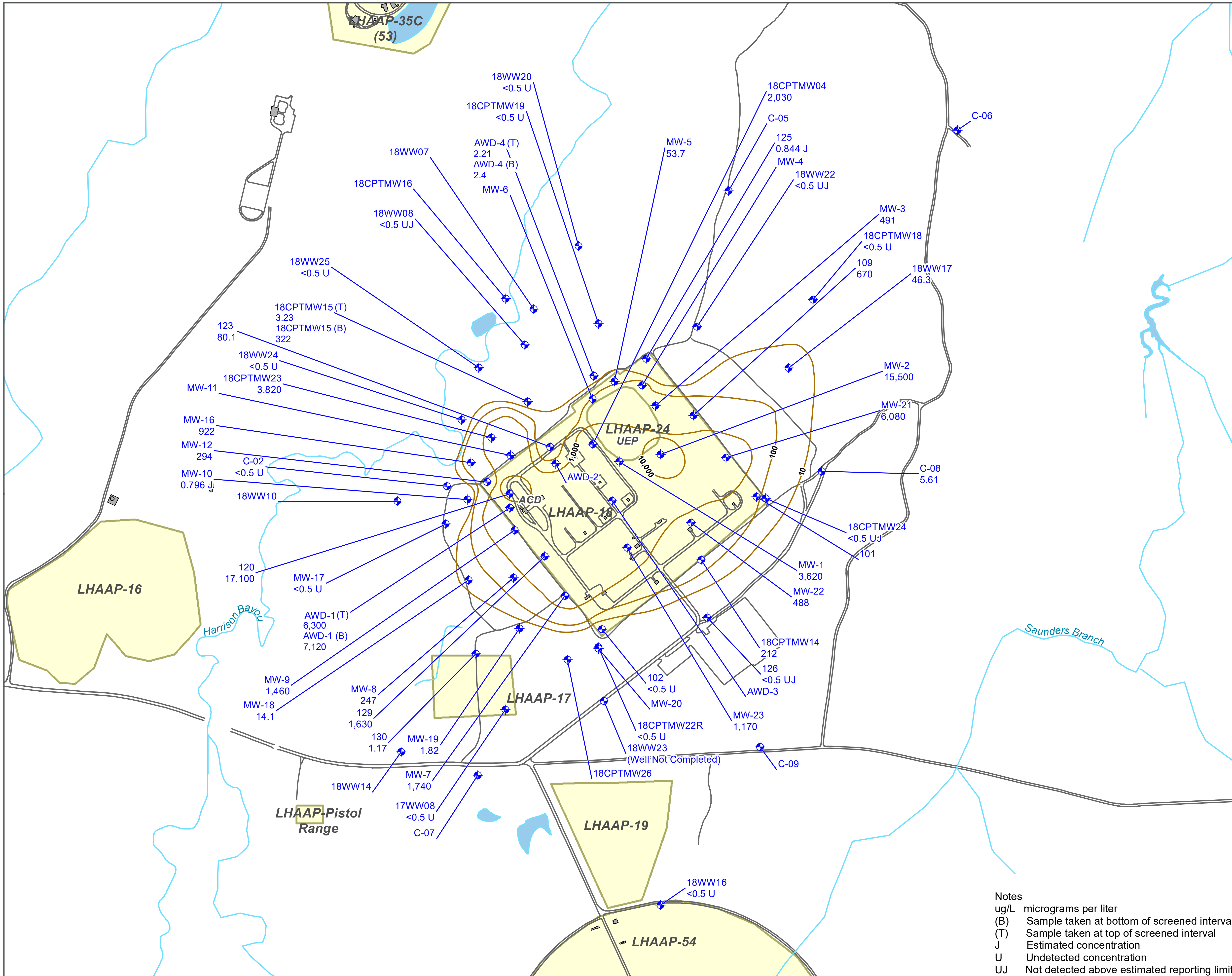
N
0 500 1,000
FEET

HDR

FIGURE 2-8

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GW_PERCH_SHALLOW_2016JUN.MXD - USER: KLOFGREN - DATE: 12/19/2019

00954314



LEGEND

- Shallow Zone Monitoring Well with Well ID and Trichloroethene Concentration in ug/L
- Trichloroethene Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

Notes
ug/L micrograms per liter
(B) Sample taken at bottom of screened interval
(T) Sample taken at top of screened interval
J Estimated concentration
U Undetected concentration
UJ Not detected above estimated reporting limit

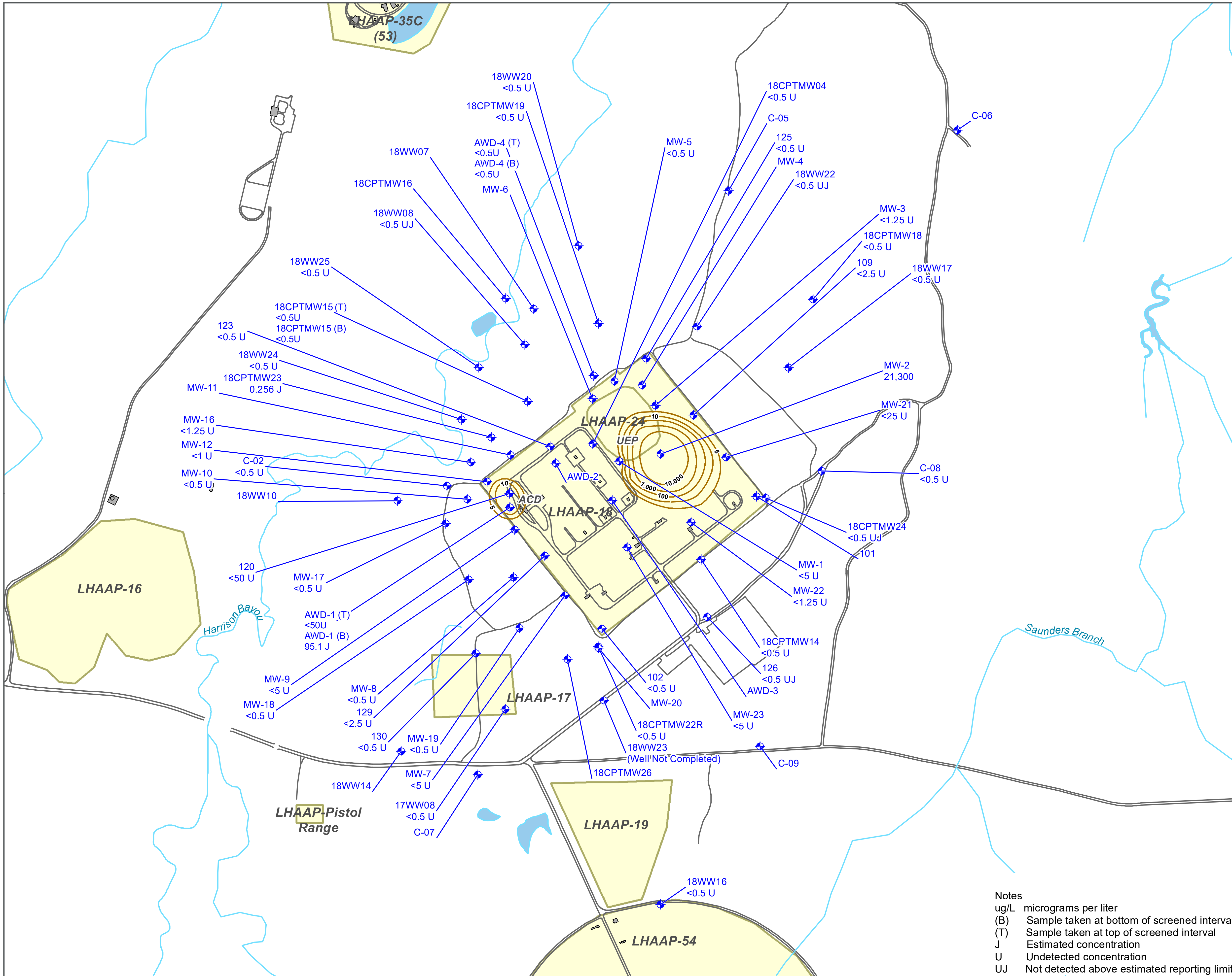
TRICHLOROETHENE ISOPLETH CONTOURS IN SHALLOW ZONE (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

N
0 500 1,000
FEET

FIGURE 2-9

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GW_TCE_SHALLOW_2016JUN.MXD - USER: KLOFGREN - DATE: 12/19/2019

00954315



Notes
ug/L micrograms per liter
(B) Sample taken at bottom of screened interval
(T) Sample taken at top of screened interval
J Estimated concentration
U Undetected concentration
UJ Not detected above estimated reporting limit

LEGEND

- Shallow Zone Monitoring Well with Well ID and Methylene Chloride Concentration in ug/L
- Methylene Chloride Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

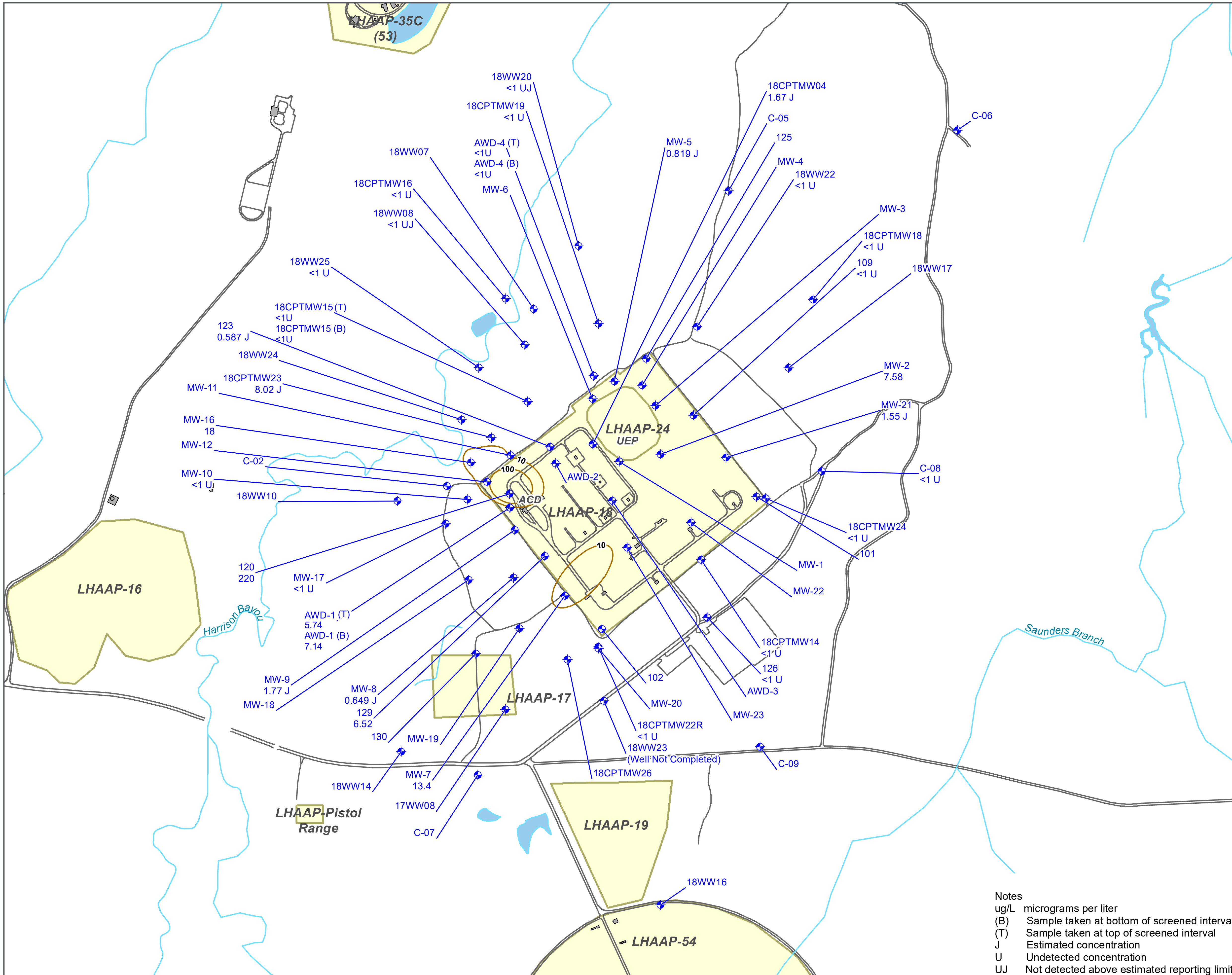
DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

METHYLENE CHLORIDE ISOPLETH CONTOURS IN SHALLOW ZONE (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

N
0 500 1,000
FEET

FIGURE 2-10



LEGEND

Shallow Zone Monitoring Well with Well ID and 1,4-Dioxane Concentration in ug/L

1,4-Dioxane Contour (µg/L)

Streams

Ponded

Roads

Buildings

Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

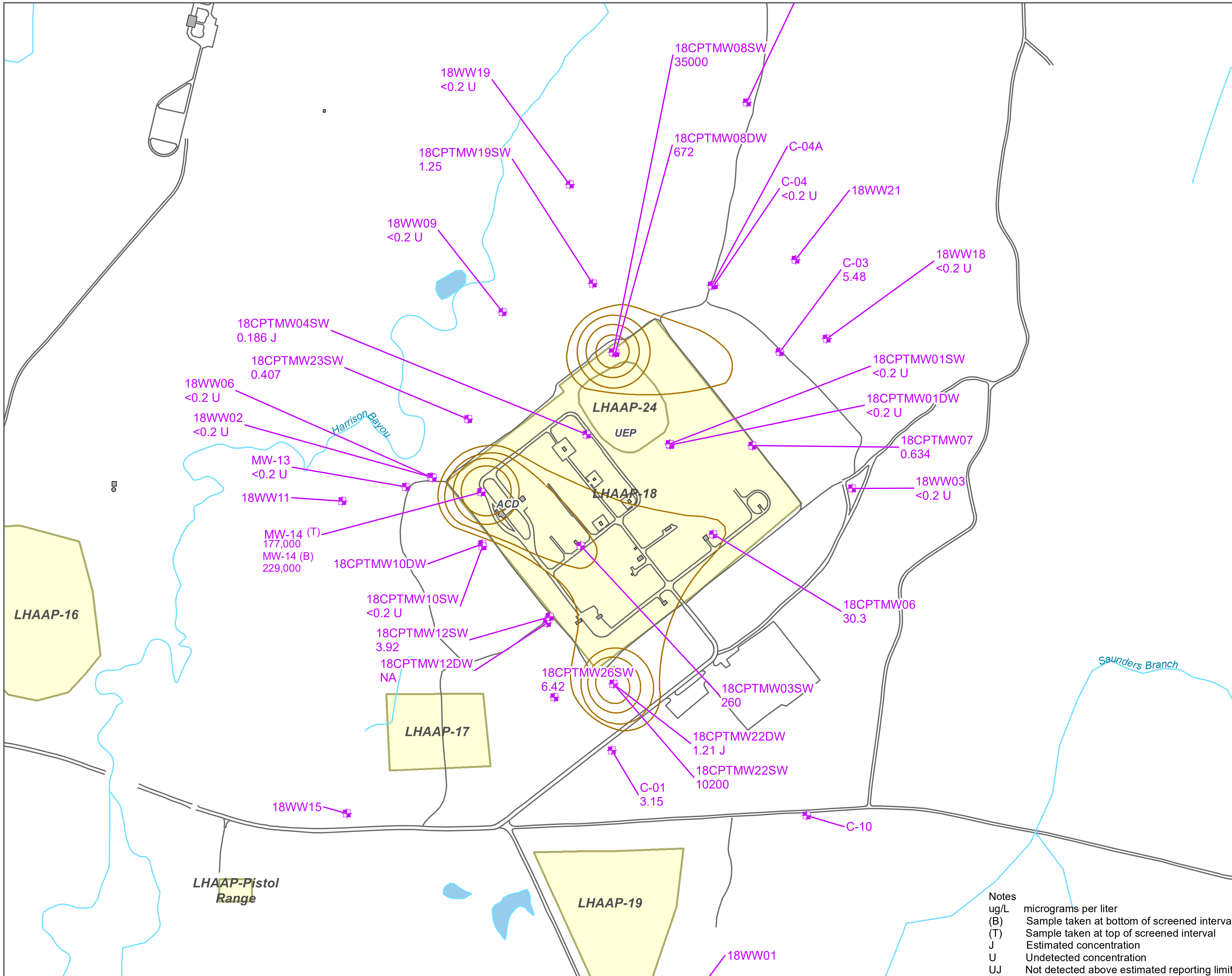
Notes
ug/L micrograms per liter
(B) Sample taken at bottom of screened interval
(T) Sample taken at top of screened interval
J Estimated concentration
U Undetected concentration
UJ Not detected above estimated reporting limit

1,4-DIOXANE ISOPLETH CONTOURS IN SHALLOW ZONE (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

FIGURE 2-11

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GW_DIOXANE_SHALLOW_2016JUN.MXD - USER: KLOFGREN - DATE: 12/19/2019

00954317



LEGEND

- Wilcox Formation Monitoring Well with Well ID and Perchlorate Concentration in ug/L
- Perchlorate Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

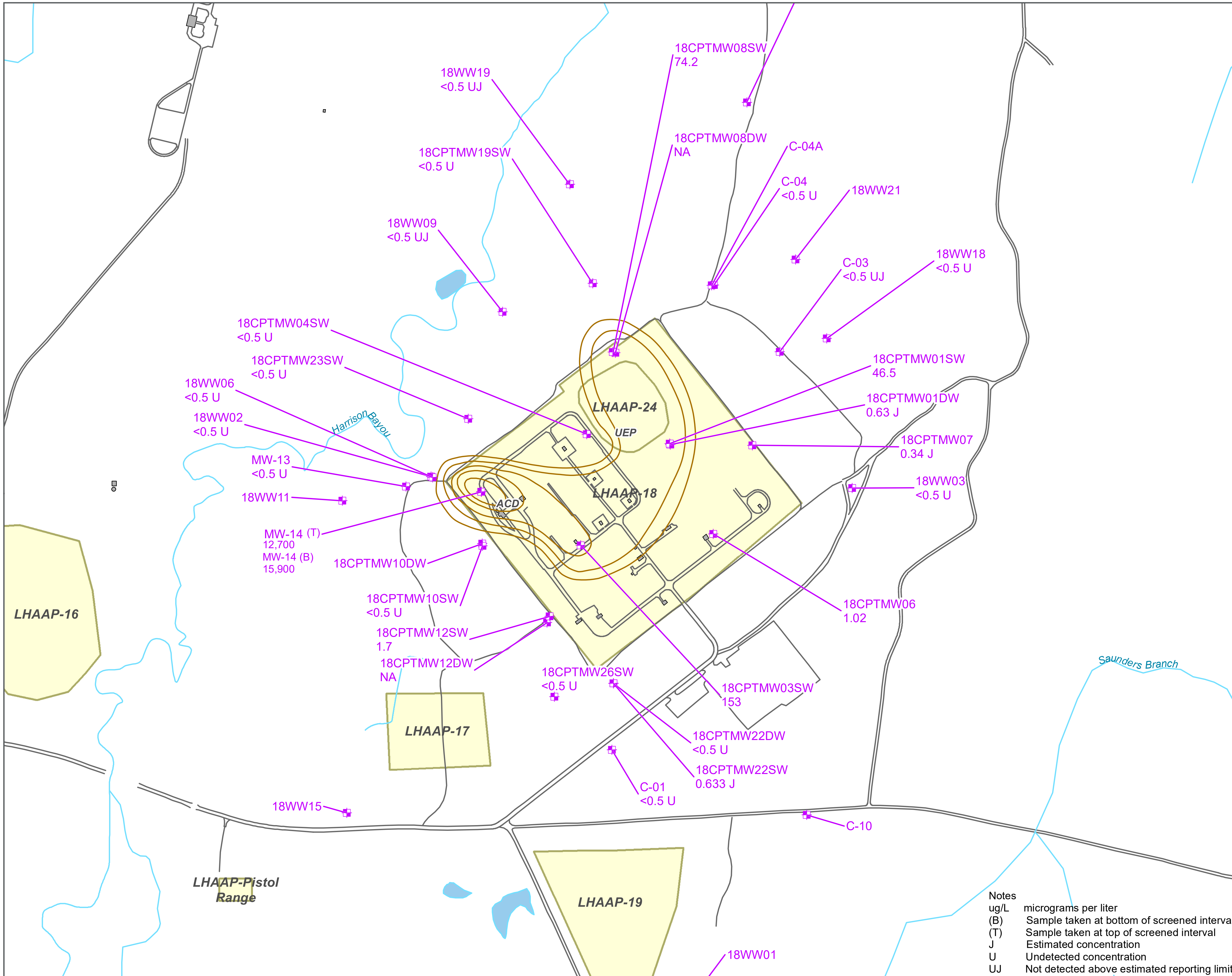
PERCHLORATE ISOPLETH CONTOURS WILCOX FORMATION (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

N
0 250 500
FEET

FIGURE 2-12

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GW_PERCH_WILCOX_JUN_2016.MXD - USER: KLOFGREN - DATE: 12/19/2019

00954318



LEGEND

- Wilcox Formation Monitoring Well with Well ID and Trichloroethene Concentration in ug/L
- Trichloroethene Contour (µg/L)
- Streams
- Ponded
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

Notes

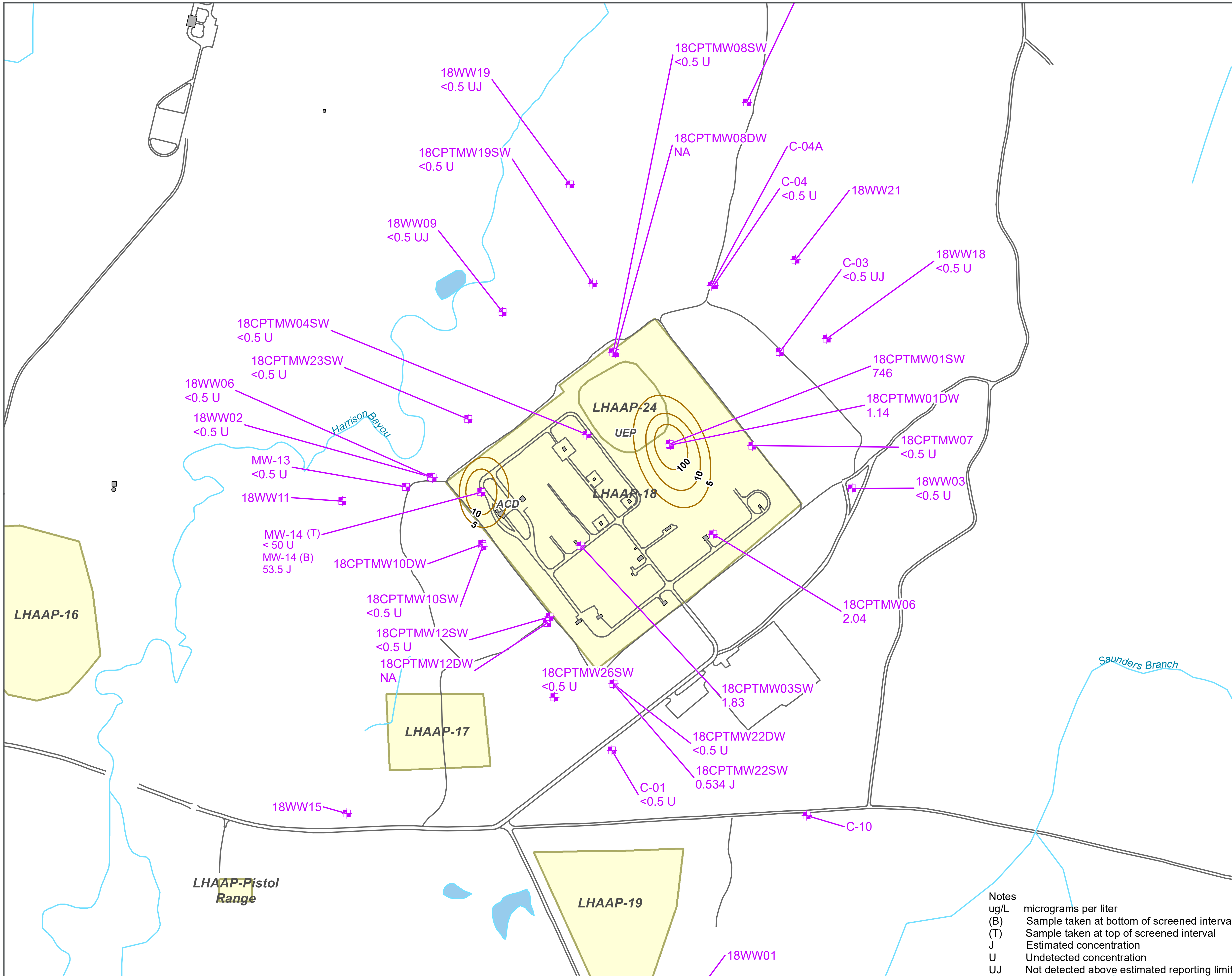
ug/L	micrograms per liter
(B)	Sample taken at bottom of screened interval
(T)	Sample taken at top of screened interval
J	Estimated concentration
U	Undetected concentration
UJ	Not detected above estimated reporting limit

TRICHLOROETHENE ISOPLETH CONTOURS WILCOX FORMATION (JUNE 2016)

LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

FIGURE 2-13

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GW_TCE_WILCOX_JUN_2016.MXD - USER: KLOFGREN - DATE: 12/19/2019



LEGEND

- Wilcox Formation Monitoring Well with Well ID and Methylene Chloride Concentration in ug/L
- Methylene Chloride Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

Notes

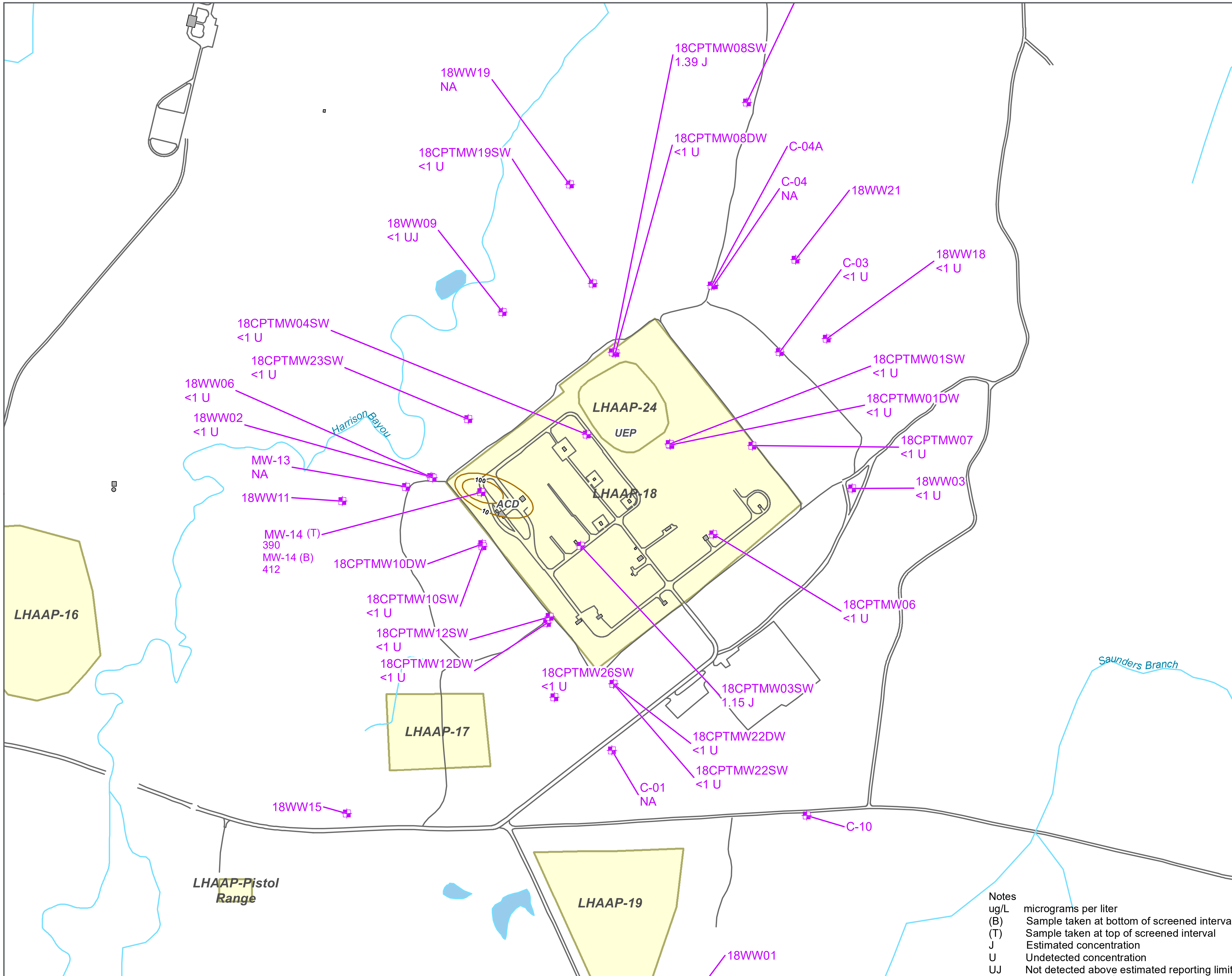
ug/L	micrograms per liter
(B)	Sample taken at bottom of screened interval
(T)	Sample taken at top of screened interval
J	Estimated concentration
U	Undetected concentration
UJ	Not detected above estimated reporting limit

METHYLENE CHLORIDE ISOPLETH CONTOURS WILCOX FORMATION (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

N
0 250 500
FEET

FIGURE 2-14

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GW_METHCHLOR_WILCOX_JUN_2016.MXD - USER: KLOFGREN - DATE: 12/19/2019



LEGEND

- Wilcox Formation Monitoring Well with Well ID and 1, 4-Dioxane Concentration in ug/L
- 1, 4-Dioxane Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

1, 4-DIOXANE ISOPLETH CONTOURS
WILCOX FORMATION (JUNE 2016)
LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

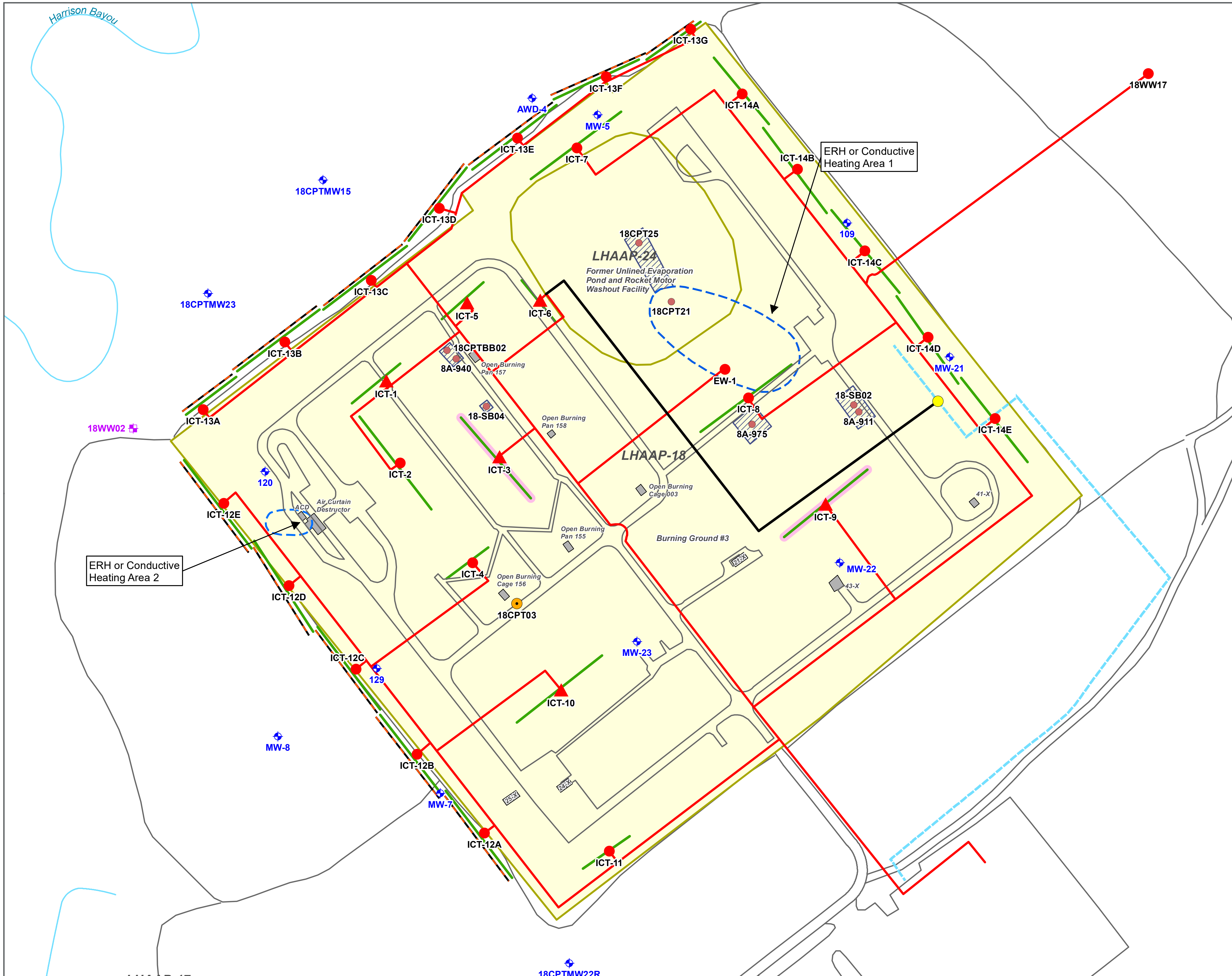
N
0 250 500
FEET

Notes

ug/L	micrograms per liter
(B)	Sample taken at bottom of screened interval
(T)	Sample taken at top of screened interval
J	Estimated concentration
U	Undetected concentration
UJ	Not detected above estimated reporting limit

FIGURE 2-15

00954321



LEGEND

- Extraction Location
- Currently Deactivated Sump
- Injection Point (discontinued)
- Soil Boring
- Shallow Zone Monitoring Well
- Wilcox Formation Monitoring Well
- Soil Boring - May 2013
- Injection Line Tie In Point
- ICT Location
- HDPE Liner Installed on the Outside of the ICT
- Extraction Pipeline
- Irrigation Pipeline
- Road
- Stream
- Site
- Former Building or Concrete Slab

Alternative 5 Activities

- Reactivate Sump - Enhanced Groundwater Extraction
- DNAPL Removal Area - Thermal Treatment
- Excavation Area up to 12 Feet Below Ground Surface

ACD – Air Curtain Destructor

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

THERMAL TREATMENT (ERH OR CONDUCTIVE HEATING) AREAS, ENHANCED GROUNDWATER EXTRACTION LOCATIONS AND AREAS OF SOIL EXCAVATION

LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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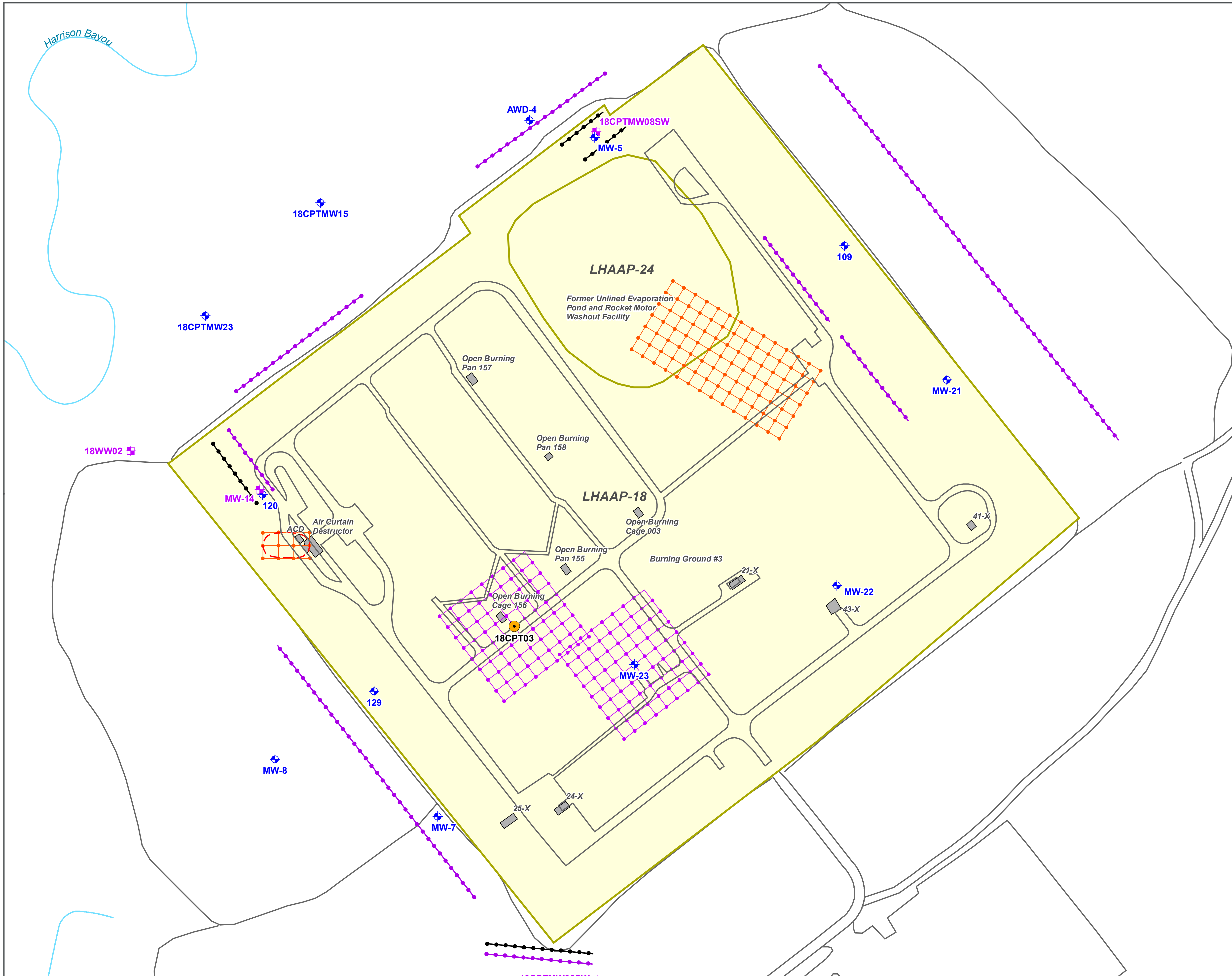
FEET

FIGURE 2-16

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_GW_EXTRACTION_LOCATIONS.MXD - USER: KLOFGREN - DATE: 12/26/2019



LEGEND

Road

Stream

Site

Former Building or Concrete Slab

Shallow Zone Monitoring Well

Wilcox Formation Monitoring Well

Soil Boring - May 2013

Alternative 5 Activities

Shallow Zone ISB

Wilcox ISB

Shallow Zone ISB Grid

Shallow Zone ISB Grid after DNAPL Removal

Notes

ISB In-Situ Bioremediation

Barriers, grids and other remedy component features shown in this figure were used to facilitate comparison of alternatives including costs. The locations, number and layout may change during Remedial Design phase.

ACD – Air Curtain Destructor

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

ENHANCED IN-SITU BIOREMEDIATION LOCATIONS

LHAAP 18/24

LONGHORN ARMY AMMUNITION PLANT

KARNACK, TEXAS

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FEET

FIGURE 2-17

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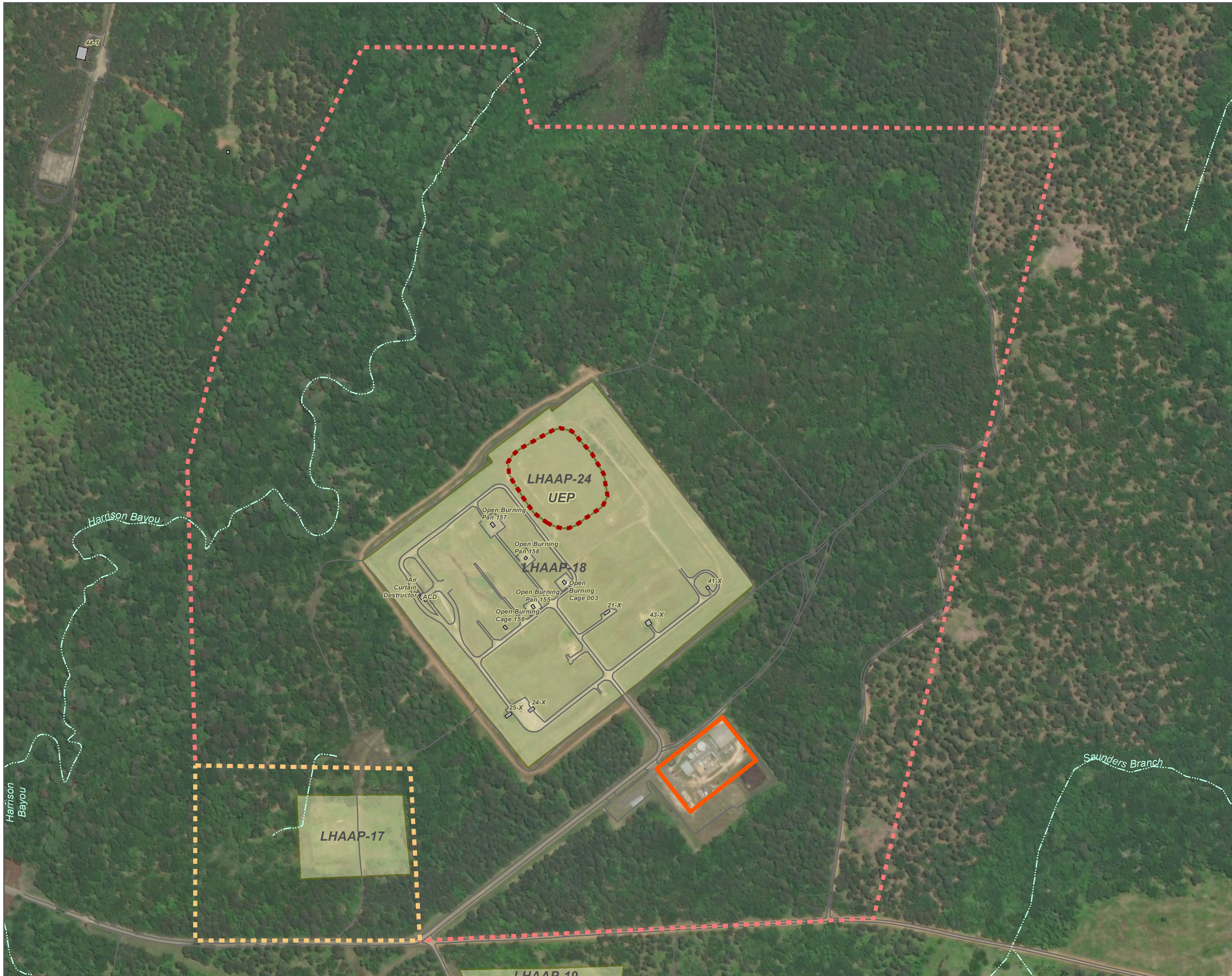

LEGEND

Preliminary Land Use Control Boundary

- LUC 17
- LUC 18
- LUC 24 (UEP)
- GWTP – Groundwater Treatment Plant
- Roads
- Streams
- Buildings
- Site

ACD – Air Curtain Destructor, UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

PRELIMINARY LAND USE CONTROL BOUNDARY

LHAAP 18/24
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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FEET

FIGURE 2-18

PATH: J:\2018\18-025_LHAAP_SITES29_47_18AND24_ROD_(WERNER)\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\LHAAP18_24\LHAAP_18_24_ROD_LUC.MXD - USER: KLOFGREN - DATE: 12/26/2019

3. Responsiveness Summary

The Responsiveness Summary serves three purposes. First, it provides the U .S. Army, USEPA, and TCEQ with information about community concerns with the preferred alternative at LHAAP-18/24 as presented in the PP. Second, it shows how the public's comments were considered in the decision-making process for selection of the remedy. Third, it provides a formal mechanism for the U.S. Army to respond to public comments. One public comment period and public meeting were held for the LHAAP-18/24 PP. Responsiveness summaries for the meeting are provided below.

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-18/24 through a public meeting, the Administrative Record for the facility, and an announcement published in the Shreveport Times and Marshall News Messenger newspapers. **Section 2.3** discusses community participation on LHAAP-18/24, including the dates for the public comment period, the date, location, and time of the public meeting, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record for the comment period and public meeting:

- Transcript of the public meeting held on April 25, 2019;
- Presentation slides from the April 25, 2019 public meeting;
- Written questions and comments from the public during the public comment period, and the U.S. Army response to those comments, presented in this ROD; and

Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including comments received from the public and community groups in written and verbal form. Verbal comments and questions were discussed and addressed during the public meeting on April 25, 2019 and are summarized below. Responses to written comments are presented following the verbal comments.

<u>2019 Proposed Plan Verbal Comments</u>

Question/Comment: Looking at the figure against the wall that shows the plumes in the Shallow Zone it also shows an area for monitored natural attenuation. But all the plumes are not covered by that MNA area. Could you explain why?

Response: *The reason that all of the wells within the plumes aren't part of the MNA area is because they are upgradient of where the contamination is. So, historically, those concentrations haven't been increasing because the primary flow direction is towards the bayou. The gray area represents the area where we will be monitoring for concentrations to be dropping over time demonstrating that natural attenuation is occurring. But some of those upgradient wells may be part of the sampling program and be monitored for natural attenuation parameters also. A lot of this is decided in the remedial design phase, so this is the '10,000-foot look' at what the remediation alternative is, and then you really get into the details during the remedial design phase.*

Question/Comment: I have a question about where you intend to use EISB. You said that was inside and outside the containment area, but on your maps it seems to me the locations are all inside the containment area.

Response: *There are lines shown outside the containment area that represent linear ISB injection locations. Again, this is the conceptual design, so the actual locations may shift during the remedial design to better address the contamination.*

Question/Comment: When I evaluate these kind of plans, there are three questions I try to answer. First is, have all the contaminants been identified; the second is, has the extent of contamination been determined--that's both horizontally and vertically--and, finally, if the proposed plan is implemented, is it likely to clean up contaminants in a reasonable amount of time. And my initial answers to all three of those questions is yes. I think that you've identified all the contaminants; you've identified the extent; and as far as the cleanup plan working, I am concerned mostly with DNAPL, because we all -- for those of you who have been involved, you know that DNAPLs are probably the most difficult thing to clean up that we deal with. And this technology that you plan to use is new to me; but I've done a little research on it, and I went looking for examples where the technology didn't work, but I was unable to find an example where it didn't work. It might be out there; but in all the cases I've looked at, have worked, so I think it's quite promising. I do have one criticism, though, and that has to do with metals. You've mentioned the fact that metals are present in groundwater, including arsenic and chromium; but nowhere in any of the documents I've looked at does the Army explicitly say "This is how we're going to clean up the metals", or do they say, alternatively, "We don't need to clean up the metals”. I think that we need more explanation of what you intend to do, if anything, about the metals. Other than that it’s a good and reasonable plan.

Response: *Thank you.* The metals will be addressed through monitoring over time and will be evaluated at five year reviews. If any further action is required to demonstrate protectiveness, that also will be addressed during the five year review.

2019 Proposed Plan Written Comments

Question/Comment: DNAPLs are the most difficult contaminants to remove from an aquifer. The thermal technology that the Army is proposing to use is probably the most effective means of cleaning up DNAPL that is available.

Response: *No response required.*

Question/Comment: Groundwater at the site is contaminated with metals (see tables 1 and 2). However, the Army has not clearly stated what, if anything, it intends to do about the metals. The Army should either 1) develop a plan that clearly states how it intends to clean up metals, or 2) explain why the cleanup is unnecessary.

Response: *Isolated detections of metals in the shallow zone at concentrations exceeding the MCLs/PCLs occur across the site, but without the clear plume patterns exhibited by VOCs. The major metals in the Shallow Zone are arsenic, barium, and chromium. The other metals (cobalt and nickel) are not detected consistently. In the Wilcox Formation, sporadic detections of arsenic above the MCL were reported in three wells. Groundwater monitoring will be conducted to evaluate metals and the need to continue monitoring for metals will be evaluated at five year intervals. In addition,* *the LUCs that will be put in place will prevent human exposure to unacceptable metals concentrations.*

Question/Comment: There are three areas in the Wilcox Formation where the vertical extent of groundwater contamination has not been determined. The first is in the north central portion of the site, at well 18CPTMW01DW. Methylene chloride concentrations at this well exceed the drinking water standard. The second is along the northern boundary of the site, at well 18CPTMW08DW. Perchlorate concentrations at this well exceed the drinking water standard. The third is in the western corner of the site, at well M-14. Perchlorate, solvents (e.g., methylene chloride, TCE), and 1,4-dioxane concentrations exceed the drinking water standards.

The Army should install additional wells in these areas to determine the vertical extent of contamination.

Response: To clarify, the vertical extent of all wells outside the contained area has been determined. However, the three wells identified are inside the contained area. Well 18CPTMW01DW has been below MCL for methylene chloride in 2016 and 2018 sampling events and will continue to be monitored to ensure vertical extent is defined. While 18CPWMW08DW has remained above the PCL for perchlorate and MW-14 has remained above the cleanup standards for perchlorate, MC and TCE and 1,4-dioxane during 2016 and 2018 sampling events, it is anticipated that the RD will include ISB treatment for these two sections of the site. The Army intends to implement the active remediation in these areas prior to considering installing any deeper wells to avoid creating a potential conduit for downward migration.

Question/Comment: With regard to 18/24, we heard the contractor, HDR, state that the vertical extent was known. Can they please tell us which wells were used to determine the vertical extent and the accompanying analysis of those wells over time?

Response: *The statement made during the presentation should have been limited to the areas outside the contained area. The vertical extent is not defined at two of the locations cited in the previous comment. See previous response.*

Question/Comment: The Army claims that the In-situ Thermal Treatment system will remove 99.9% of the DNAPL at site 18/24. However, the Army does not provide a reference to information that supports this claim. The Army should state where the information can be found.

Response: *The estimate for removal efficiency was obtained from Vendor-supplied information for thermal treatment technologies. Additional information regarding performance of thermal technologies is available at: https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Persistent-Contamination/ER-200314/ER-200314-TR.*

Question/Comment: The Army estimates that cleanup will be completed in 20 years. However, the Army does not provide a reference to the calculations that support this estimate. The Army should state where the calculations can be found.

Response: *The cleanup duration is described in the January 2017 Revised Feasibility Study Report – LHAAP-18/24. The cleanup duration is based on the Natural Attenuation Evaluation included in Appendix A of the FS.*

4. References

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Sverdrup Environmental, Inc., 1999. *Sampling and Data Results Report for the Group 2 Sites Phase III Remedial Investigation/ Feasibility Study, at Longhorn Army Ammunition Plant, Karnack. Texas.* Prepared for the U.S. Army Corps of Engineers, Tulsa District. April.

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Appendix A

Public Notice Affidavits

00954331

THE MARSHALL NEWS MESSENGER

The Marshall News Messenger
309 E Austin
Marshall, TX 75670

Phone:**(903) 935-7914** Fax:**(903) 935-6242** Email:

04/03/19

AFFIDAVIT OF PUBLICATION

State of Texas)

County of Harrison)

This Affidavit of Publication for the Marshall News Messenger, a daily newspaper of general circulation, printed and published at Marshall, hereby certifies that the attached legal notice, ad # 640129, was published in said newspaper on April 3, 2019, and that copies of each paper in which said Public Notice was published were delivered by carriers to the subscribers of said paper, according to their accustomed mode of business in this office.

Dianne Gray
for the Marshall News Messenger

The above Affidavit and Certificate of Publication was subscribed and sworn to before me by the above-named Dianne Gray, who is personally known to me to be the identical person in the above certificate on this 12th day of April, 2019.

Dana Morton
Notary Public in and for
State of Texas)
County of Harrison)

My commission expires 3-21-21

NOTARY PUBLIC STATE OF TEXAS
DANA MORTON
Notary Public, State of Texas
Comm. Expires 03-21-2021
Notary ID 2485572

ad id: 640129

PUBLIC NOTICE

THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE FINAL REMEDY FOR ENVIRONMENTAL SITE LHAAP-18/24, BURNING GROUND No. 3 AND UNLINED EVAPORATION POND, LONGHORN ARMY AMMUNITION PLANT, TEXAS

PUBLIC MEETING ON APRIL 25, 2019
AT THE KARNACK COMMUNITY CENTER, KARNACK, TX

The U.S. Army is the lead agency for environmental response actions at Longhorn Army Ammunition Plant (LHAAP). In partnership with the U.S. Environmental Protection Agency Region 6 (USEPA), the lead Oversight Agency, and Texas Commission on Environmental Quality, the Supporting Agency, the U.S. Army has developed the Proposed Plan for site LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond. Although the Proposed Plan identifies the preferred final remedy for the site, the U.S. Army welcomes the public's review and comment. Beginning on April 2, 2019, copies of the Proposed Plan and supporting documentation will be available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670 and on the LHAAP website at http://www.longhornaap.com/LHAAP-18-24. The public comment period is April 2, 2019 through May 2, 2019. The public meeting will be held on Thursday, April 25, 2019 at the Karnack Community Center, Karnack, TX beginning at 6:00 PM and ending at 7:30 PM. The Karnack Community Center is located at Highway 134 and Spur 449 near the front gate of the Caddo Lake National Wildlife Refuge. Questions, comments, and responses on the Proposed Plan will be recorded by a court reporter during the public meeting. Written comments will be accepted throughout the public comment period.

LHAAP is an inactive, government-owned, formerly contractor-operated industrial facility located in central-east Texas in the northeastern corner of Harrison County. The former installation occupied nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. LHAAP was established in December 1941 near the beginning of World War II for the manufacture of trinitrotoluene. Other past industrial operations at the installation included the production of secondary explosives, rocket motor propellants, and various pyrotechnics. LHAAP was found to have actual and potential releases of hazardous substances or pollutants or contaminants associated with past operations, and it was added to the National Priorities List (NPL) in 1990.

LHAAP-18/24, known as the Burning Ground No. 3 (18) and Unlined Evaporation Pond (UEP) (24), is a 34.5 acre fenced, cleared area (containment area) located in the southeastern section of LHAAP. The area was used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent waste by open burning/open detonation, incineration, evaporation, and burial. LHAAP-18 Burning Ground No. 3 operated between 1955 and 1998 and LHAAP- 24 UEP was used to collect water from the washout of rocket motor casings and process waste sumps from 1963 to 1984.

The Proposed Plan for LHAAP-18/24 addresses potential risks associated with exposure to contaminated soil and groundwater in both the shallow zone and Wilcox formation and also prevents contaminated groundwater from migrating and impacting surface water at unacceptable levels. The full list of alternatives evaluated is: 1) no action; 2) enhanced groundwater extraction and ex-situ treatment, and land use controls (LUCs) in the shallow zone and Wilcox formation, enhanced in-situ bioremediation (EISB) inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal; 3) groundwater extraction and treatment, monitored natural attenuation (MNA) outside the containment area in the shallow zone and Wilcox formation, LUCs in the shallow zone and Wilcox formation, and containment; 4) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and surfactant enhanced dense non-aqueous phase liquid (DNAPL) removal; 5) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and thermal DNAPL removal; and 6) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and enhanced DNAPL remediation using zero-valent iron (ZVI). Based on available information, the preferred remedy is Alternative 5, which would remove contaminated soil from LHAAP-18/24 with off-site disposal; reduce groundwater contamination in the shallow zone and Wilcox formation through extraction and treatment and EISB, employ thermal DNAPL removal, and ongoing LUCs to assure protection of human health and the environment. Through the use of treatment technologies, Alternative 5 will permanently reduce the toxicity, mobility, and volume of source materials that constitute the principal threat wastes at the site.

For further information or to submit written comments, contact:
Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951;
phone number 479-635-0110 or email rose.m.zeiler.civ@mail.mil.

The Times

State of Louisiana
Parish of Caddo
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__________, personally known to me who being duly sworn, deposes and says that he/she is the LEGAL CLERK, for The Times, and that the attached advertisement published entitled:

PUBLIC NOTICE THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE FINAL REMEDY FOR ENVIRONMENTAL SITE LHAAP-18/24, BURNING GROUND NO. 3

Notice published in the Times on 04/05/19

(Signed)__________

__________ 9/5/2019
Notary Public. State of Wisconsin. County of Brown

8-25-23
My commission expires

SHELLY HORA
Notary Public
State of Wisconsin

00954333

PUBLIC NOTICE THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE FINAL REMEDY FOR ENVIRONMENTAL SITE LHAAP-18/24, BURNING GROUND NO. 3 AND UNLINED EVAPORATION POND, LONGHORN ARMY AMMUNITION PLANT, TEXAS PUBLIC MEETING ON APRIL 25, 2019 AT THE KARNACK COMMUNITY CENTER, KARNACK, TX

The U.S. Army is the lead agency for environmental response actions at Longhorn Army Ammunition Plant (LHAAP). In partnership with the U.S. Environmental Protection Agency Region 6 (USEPA), the lead Oversight Agency, and Texas Commission on Environmental Quality, the Supporting Agency, the U.S. Army has developed the Proposed Plan for site LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond. Although the Proposed Plan identifies the preferred final remedy for the site, the U.S. Army welcomes the public's review and comment. Beginning on April 2, 2019, copies of the Proposed Plan and supporting documentation will be available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670 and on the LHAAP website at http://www.longhornaap.com/LHAAP-18-24. The public comment period is April 2, 2019 through May 5, 2019. **The public meeting will be held on Thursday, April 25, 2019 at the Karnack Community Center, Karnack, TX beginning at 6:00 PM and ending at 7:30 PM.** The Karnack Community Center is located at Highway 134 and Spur 449 near the front gate of the Caddo Lake National Wildlife Refuge. Questions, comments, and responses on the Proposed Plan will be recorded by a court reporter during the public meeting. Written comments will be accepted throughout the public comment period.

00954334

PUBLIC NOTICE THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE FINAL REMEDY FOR ENVIRONMENTAL SITE LHAAP-18/24, BURNING GROUND NO. 3 AND UNLINED EVAPORATION POND, LONGHORN ARMY AMMUNITION PLANT, TEXAS PUBLIC MEETING ON APRIL 25, 2019 AT THE KARNACK COMMUNITY CENTER, KARNACK, TX

The U.S. Army is the lead agency for environmental response actions at Longhorn Army Ammunition Plant (LHAAP). In partnership with the U.S. Environmental Protection Agency Region 6 (USEPA), the lead Oversight Agency, and Texas Commission on Environmental Quality, the Supporting Agency, the U.S. Army has developed the Proposed Plan for site LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond. Although the Proposed Plan identifies the preferred final remedy for the site, the U.S. Army welcomes the public's review and comment. Beginning on April 2, 2019, copies of the Proposed Plan and supporting documentation will be available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670 and on the LHAAP website at http://www.longhornaap.com/LHAAP-18-24. The public comment period is April 2, 2019 through May 5, 2019. **The public meeting will be held on Thursday, April 25, 2019 at the Karnack Community Center, Karnack, TX beginning at 6:00 PM and ending at 7:30 PM.** The Karnack Community Center is located at Highway 134 and Spur 449 near the front gate of the Caddo Lake National Wildlife Refuge. Questions, comments, and responses on the Proposed Plan will be recorded by a court reporter during the public meeting. Written comments will be accepted throughout the public comment period.

LHAAP is an inactive, government--owned, formerly contractor-operated industrial facility located in central-east Texas in the northeastern corner of Harrison County. The former installation occupied nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. LHAAP was established in December 1941 near the beginning of World War II for the manufacture of trinitrotoluene. Other past industrial operations at the installation included the production of secondary explosives, rocket motor propellants, and various pyrotechnics. LHAAP was found to have actual and potential releases of hazardous substances or pollutants or contaminants associated with past operations, and it was added to the National Priorities List (NPL) in 1990.

LHAAP-18/24, known as the Burning Ground No. 3 (18) and Unlined Evaporation Pond (UEP) (24), is a 34.5 acre fenced, cleared area (containment area) located in the southeastern section of LHAAP. The area was used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent waste by open burning/open detonation, incineration, evaporation, and burial. LHAAP-18 Burning Ground No. 3 operated between 1955 and 1998 and LHAAP- 24 UEP was used to collect water from the washout of rocket motor casings and process waste sumps from 1963 to 1984.

The Proposed Plan for LHAAP-18/24 addresses potential risks associated with exposure to contaminated soil and groundwater in both the shallow zone and Wilcox formation and also prevents contaminated groundwater from migrating and impacting surface water at unacceptable levels. The full list of alternatives evaluated is: 1) no action; 2) enhanced groundwater extrac-

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tion and ex-situ treatment, and land use controls (LUCs) in the shallow zone and Wilcox formation, enhanced in-situ bioremediation (EISB) inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal; 3) groundwater extraction and treatment, monitored natural attenuation (MNA) outside the containment area in the shallow zone and Wilcox formation, LUCs in the shallow zone and Wilcox formation, and containment; 4) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and surfactant enhanced dense non-aqueous phase liquid (DNAPL) removal; 5) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and thermal DNAPL removal; and 6) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and enhanced DNAPL remediation using zero-valent iron (ZVI). Based on available information, the preferred remedy is Alternative 5, which would remove contaminated soil from LHAAP-18/24 with off-site disposal; reduce groundwater contamination in the shallow zone and Wilcox formation through extraction and treatment and EISB, employ thermal DNAPL removal, and ongoing LUCs to assure protection of human health and the environment. Through the use of treatment technologies, Alternative 5 will permation and ex-situ treatment, and land use controls (LUCs) in the shallow zone and Wilcox formation, enhanced in-situ bioremediation (EISB) inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal; 3) groundwater extraction and treatment, monitored natural attenuation (MNA) outside the containment area in the shallow zone and Wilcox formation, LUCs in the shallow zone and Wilcox formation, and containment; 4) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and surfactant enhanced dense non-aqueous phase liquid (DNAPL) removal; 5) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and thermal DNAPL removal; and 6) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and enhanced DNAPL remediation using zero-valent iron (ZVI). Based on available information, the preferred remedy is Alternative 5, which would remove contaminated soil from LHAAP-18/24 with off-site disposal; reduce groundwater contamination in the shallow zone and Wilcox formation through extraction and treatment and EISB, employ thermal DNAPL removal, and ongoing LUCs to assure protection of human health and the environment. Through the use of treatment technologies, Alternative 5 will perma-

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nently reduce the toxicity, mobility, and volume of source materials that constitute the principal threat wastes at the site.

For further information or to submit written comments, contact:
Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951; phone number 479-635-0110 or email rose.m.zeiler.civ@mail.mil.
The Times
April 5, 2019

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For further information or to submit written comments, contact:
Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951; phone number 479-635-0110 or email rose.m.zeiler.civ@mail.mil.
The Times
April 5, 2019

Subject: **Final Monthly Managers' Meeting (MMM), Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting: **Teleconference**
Date of Meeting: **20 February 2020– 10:00 Central Standard Time (CST)**

Attendees:

Army BRAC:	Rose M. Zeiler (RMZ)
USEPA:	Bill Rhotenberry (BR) and Kent Becher (KB)-USGS Liaison
TCEQ:	April Palmie (AP)
USACE:	Aaron Williams (AW),
Bhate:	Kim Nemmers (KN), Scott Beesinger (SB) and Marcia Olive (MO)
APTIM:	Bill Foss (BF) and Praveen Srivastav (PS)
USFWS:	Paul Bruckwicki (PB)

Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update

Installation Wide Work Plan– KN explained that perchlorate was currently analyzed in Salt Lake City, Utah and that the majority of groundwater analyses were completed in the Houston location. KN said that the Houston location would now run perchlorate due to updated certification. MO said that it is the same method being used at both laboratory locations. MO explained that a total of seven worksheets need a revision to reference the correct Standard Operating Procedures (SOPs). MO said that the quality control (QC) remains the same. MO stated that Worksheet 15 changes the detection limits. AP asked if the detection limit changes. MO said that the detection limits are lower with Houston. MO explained that perchlorate was run by Houston in error and that the results had the lower detection limit. MO explained that the limit of detection for perchlorate is 2.0 micrograms per liter (µg/L) from Salt Lake City but is 0.05 µg/L for the Houston laboratory. KN asked if we can move forward using the Houston laboratory location. AP asked if the Houston Laboratory had the proper certifications. MO said that the Houston laboratory has the National Environmental Laboratory Accreditation Program certification for perchlorate. AP agreed for the Houston laboratory to run perchlorate if it has the proper certification(s). BR concurred. KN then asked if anyone needed a compact disc (CD) of the revised Installation Wide Work Plan or if posting on SharePoint was sufficient. RMZ asked for a CD. AW and AP indicated that they could pull the electronic copy from SharePoint.

Groundwater Treatment Plant (GWTP) – SB said that the GWTP is running satisfactorily and that that here is quite a bit of water being treated due to the rainfall. SB said that they are changing out a valve on the truck loading for the acid tank. SB said that additional acid will then be delivered the following week and that an acid wash will then be completed for the air stripper. SB explained that the acidic water will be pumped through the top and then collect it at the bottom. SB said that the goal is do the air stripper should be washed in the next week or so. KN explained that the media is in pretty good shape so flushing a couple of time should make a big different. KN also explained that we are able to continue to discharge to the bayou.

SB explained that he needed to move the ladder to the granular activated carbon (GAC) vessels to evaluate the weld around nozzle of the vessels to see what needs to be done to repair. SB explained that the weld had rusted and that it was leaking out previously. If the repair can be completed, then SB will try to backwash the GAC vessels.

LHAAP-04 and 46– PS said that the sampling was completed for both of LHAAP-04 and LHAAP-46 in February 2020. KB asked SB if there were a lot of dry wells. SB said that there were 7 or 8 dry wells. SB said that the wells normally dry were still dry.

LHAAP-16- PS said that the first round of design effectiveness sampling was completed. BF explained that the sampling was completed from November 2019 through January 2020, and that Biobarrier 2 injections were completed two days before Christmas. Therefore, BF explained that the design effectiveness sampling was completed on 23 January 2020. PS explained that total organic carbon re-analysis was required for some of the samples. PS explained that some of the wells would be resampled to further evaluate design effectiveness and will be included in the Remedial Action Completion Report (RACR). PS said the additional sampling will be completed in March. PS said that year 1 quarter 1 performance sampling at LHAAP-16 will also be completed in March and includes approximately 50 monitoring wells.

LHAAP-50 – PS said that injections are planned for the first week of 9 March 2020. PS said that the Underground Injection Control (UIC) notification was sent out to TCEQ on 5 February 2020. AP said she received the UIC information. PS said that the 9 March mobilization date was selected because it is about 30 days out from submittal of UIC notification. PS said that most of LHAAP-50 is accessible but a portion of the site may be difficult to access. PS said that injections will be postponed if the wet conditions continue.

Well abandonment - PS said that the well abandonment is planned for the week of 2 March 2020. PS said that SB is evaluating for wet conditions and accessibility of each wells.

Enforceable Schedule - RMZ wants to set up a call to discuss the enforceable schedule with AP and BR. AP, BR and RMZ agreed to discuss on Tuesday, 25 February 2020.

Post-Screening Investigation (PSI) Scoping - AW said that HDR, Inc. (HDR) is going ahead to get quotes for the modification that will be issued. AW explained that, for the one deep well, the driller is asking if the new monitoring well can be a 2-inch diameter well to use sonic drill versus the 4-inch diameter well, which will require mud rotary. AP confirmed that the deep well is being installed for groundwater delineation. AW said that soil samples are not being collected during installation of this one deep well. AW said that the deep well is just for evaluating groundwater. RMZ said that the location of the well will still get Regulatory input. AP asked if you can get a core with sonic and why not hollow-stem? AW explained that the driller said that only mud rotary is available at the depth. AP wondered what KB thoughts were. KB agreed that avoiding mud rotary is preferred especially with the potential for heaving sands. KB said that a 2-inch diameter monitoring well is fine for groundwater sampling but if you wanted to do passive sampling or something else that the 2-inch diameter monitoring well may limit you. RMZ said that if additional investigation is need for the deep aquifer, then additional monitoring wells would be needed also – which could then be installed as 4-inch wells. KB said that USEPA used sonic drill rig and ran into issues in a sandier site. RMZ said that the driller could be asked for their experience in similar soils but felt the driller would not recommend the use of sonic if they were not experienced. AP said that she is good with the 2-inch monitoring well but is also interested in hear about the driller experience. BR is good with trying it and putting in a 2-inch monitoring well. BF suggested that AW verify that they are telescoping. AW said that HDR had already clarified that telescoping would be used.

KN asked everyone to refer to the Document and Issues Tracking Table dated February 20, 2020.

- **Task 1** (Project Management) – KN stated that minutes for the MMM and Restoration Advisory Board (RAB) in January are out as final or to the RAB members for approval at the April 2020 RAB meeting.

- **Task 3** (LHAAP-03) – PS said that one wall of the excavation still needs to be further excavated for arsenic. PS said that the water is still present so the wall excavation has not been completed and is awaiting drier conditions.
- **Task 4** (LHAAP-04) **–** PS said that injections are done and that the RACR is being prepared. PS said that the RACR is listed as being due out in March to the Regulators, which may be tight with Army reviews such that the document may get pushed out for Regulatory review until April 2020.
- **Task 5** (LHAAP-12) **–** PS said that the Remedial Action Operation (RA-O) sampling for LHAAP-12 was completed in December 2019 and that the validated data was included in February 2020 MMM data validation package. BF said that the new monitoring well results were clean. PS said that the 2019 Annual RA-O Report was in preparation.
- **Task 6** (LHAAP-16) **–** PS said that an additional round of design effectiveness sampling is planned for March 2020 and then that data will be provided. PS said that the RACR is being prepared with the draft report expected to be to the Regulators in May 2020.
- **Task 7** (LHAAP-17) **–** PS explained that drier conditions were needed to complete the backfilling of verified clean areas.
- **Task 9** (LHAAP-37) **–** PS stated that the Year 3 1st semiannual sampling results are included in the February 2020 MMM. PS stated that the Year 2 Annual RA-O Report was in internal review.
- **Task 10** (LHAAP-46) –PS stated that Year 5 Annual RA-O data report was in internal review and that the Year 6 sampling was just completed.
- **Task 11** (LHAAP-50) –PS stated that the Year 5 RA-O Report was in internal review. PS stated that the Remedial Design (RD)/Remedial Action Work Plan (RAWP) was approved and needed to be put into the Administrative Record (AR).
- **Task 12** (LHAAP-58) – KN stated that groundwater sampling of the eastern and western plumes had been completed in December 2019 and that the sampling results were included in the February 2020 MMM. KN stated that the next sampling event is planned for March 2020. KN explained that the sampling schedule was provided and that LHAAP-58 would be going from quarterly to semi-annual sampling in June 2020.
- **Task 13** (LHAAP-67) – PS stated the Year 5 Annual RA-O Report submitted to the Regulators on 7 February 2020.
- **Task 14** (LHAAP-001-R and –003-R) - KN stated that Land Use Control (LUC) inspections had been completed in January 2020 and that no damage was noted.
- **Task 16** (GWTP) **–** KN indicated that Regulator comments on the3rd Quarter 2019 GWTP Report had been received and would be addressed in the 4th Quarter 2019 GWTP Report. KN stated that the 4th Quarter 2019 GWTP Report was being prepared for Army review.
- **Task 17** (LHAAP-18/24) – KN stated that the validated data from the LHAAP-18/24 sampling completed in December 2019 was provided with the other February 2020 MMM data. .
- **Task 18** (Surface Water) – KN stated that 1st Quarter 2020 surface water samples had been collected and that there were no exceedances. KN stated that the results would be included in the 2020 MMM validated data.
- **Task 19** (LUC Management Plan) – Not discussed
- **Administrative Record (AR) –**PS stated that the AR through June 2019 was being produced for distribution.

Update on other DERP Sites:

- **LHAAP 18/24** –AW stated that the TCEQ had provided an approval letter. BR said that the ROD was in routing at the EPA now that the TCEQ letter was received.
- **LHAAP-29 –** AW said that the Record of Decision (ROD) was being placed into the AR.
- **LHAAP-47 –** AW explained that the Interim Addendum PSI Report #2 was being held awaiting the additional investigation.
- **Well Abandonment –** AW stated that only 50 monitoring wells were included in Bhate's contract so the wells at Site 1 were not included in the abandonment list.

Schedule Next Managers' Meeting
The next MMM will be held on Tuesday, March 31, 2020 at 11:00 am CDT via conference call.

Meeting concluded at approximately 10:51 pm CST.

ACRONYM LIST

µg/L	micrograms per liter
AP	April Palmie
APTIM	APTIM Federal Services, LLC
AR	Administrative Record
AW	Aaron Williams
BF	Bill Foss
Bhate	Bhate Environmental Associates, Inc.
BR	Bill Rhotenberry
BRAC	Base Realignment and Closure
CD	Compact Disc
CST	Central Standard Time
DERP	Defense Environmental Restoration Program
GAC	Granular Activated Carbon
GWTP	Groundwater Treatment Plant
HDR	HDR, Inc.
KB	Kent Becher
KN	Kim Nemmers
LHAAP	Longhorn Army Ammunition Plant
LUC	Land Use Control
MMM	Monthly Managers' Meeting
MO	Marcia Olive
PB	Paul Bruckwicki
PBR	Performance-Based Remediation
PP	Proposed Plan
PS	Praveen Srivastav
PSI	Post-Screening Investigation
QC	Quality Control
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RA-O	Remedial Action – Operation
RAWP	Remedial Action Work Plan
RD	Remedial Design
RMZ	Rose M. Zeiler
ROD	Record of Decision
SB	Scott Beesinger

SOP	Standard Operating Procedure
TCEQ	Texas Commission on Environmental Quality
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

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LHAAP Validated Data Packages for
February 2020 Monthly Manager's Meeting

GWTP Effluent	*Weekly Perchlorate Sampling – December 2019* Perchlorate (6850)
GWTP Effluent	*Weekly, Bi-Weekly, and Monthly Sampling – December 2019* Ammonia (350.3) Ortho-Phosphate (365.3) Total Organic Carbon (SM5310C) VOC (8260C) Metals (6020A) Hexavalent Chromium (7196A) 1,4-Dioxane (8270D-SIM) Anions (9056)
GWTP Influent	*Monthly Sampling – December 2019* Metals (6020A) Perchlorate (6850) Hexavalent Chromium (7196A)
GWTP Quarterly	*Influent and Effluent – December 2019* Oil and Grease (1664A) Perchlorate (6850) Metals (6020A) 1,4-Dioxane (8270D-SIM) Chemical Oxygen Demand (410.4) VOC (8260C) Anions (9056)
LHAAP-18/24	*Semi-Annual Sampling – December 2019* Perchlorate (6850) Metals (6020A) VOCs (8260C) 1,4- Dioxane (8270D SIM)
LHAAP-58	*Semi-Annual Sampling Event– December 2019* Anions (9056) VOC (8260C) Total Organic Carbon (SM5310C) Metabolic Acids (HPLC-METACIDS) Dechlorinating Bacteria (CENSUS) Dissolved Gases (RSK-175) Arsenic (6020A)
LHAAP-12	*Year 12 Annual Sampling-December 2019* Volatile Organic Compounds (EPA 8260)
LHAAP-37	*Year 3 Remedial Action - Operation Semiannual Sampling Event #1-November 2019* Volatile Organic Compounds (EPA 8260)

GWTP Weekly/Effluent Perchlorate Sampling -December 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	INF pond (PCL)	LH18/24-SP650_120319_AIX* 12/3/19*	LH18/24-SP650_120319_AIX 12/3/19*	LH18/24-SP650_121219_AIX 12/12/19**	LH18/24-SP650_121719_BIX 12/17/19**	LH18/24-SP650_121719_BIX 12/17/19**	LH18/24-SP650_122319_BIX 12/23/19**	LH18/24-SP650_123019_BIX 12/30/19**
Location Description				Collected from a spigot on the discharge of effluent TK-650.						
				Weekly	Monthly EFF	Weekly	Weekly	Quarterly EFF	Weekly	Weekly
Perchlorate (6850)										
Perchlorate	µg/L	589	17	**1.2 J**	**1.3 J**	< 2.0 U	**1.7 J**	**1.9 J**	**6.7**	< 2.0 U

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

AIX - after ion exchange

BIX - before ion exchange

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

* discharged to INF Pond

**discharged to Harrison Bayou

GWTP Weekly Sampling - December 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_120319 12/3/19	LH18/24-SP650_121219 12/12/19	LH18/24-SP650_121719 12/17/19	LH18/24-SP650_122319 12/23/19	LH18/24-SP650_123019 12/30/19
Location Description			**GWTP–Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.**				
Ammonia as N (350.3)							
Ammonia as N	mg/L	NV	**3.9**	**8**	**0.35**	**4.3**	**2.1**
Ortho-Phosphate (365.3)							
Ortho-Phosphate	mg/L	NV	**0.733**	**1.23**	**0.0110 J**	**0.613**	**0.537**
Organic Carbon (SM5310C)							
Total Organic Carbon (TOC)	mg/L	NV	**1.5**	**0.99 J**	**2.19**	**2.46**	**2.13**

mg/L - milligrams per liter

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

GWTP Bi-Weekly Sampling - December 2019*

Location ID: Sample Date:	Units	(Bayou) Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_120419_BIX 12/4/19**	LH18/24-SP650_120419_AIX 12/4/19**	INF Inlet_120419 12/4/19**	LH18/24-SP650_121219 12/12/19	LH18/24-SP650_122319 12/23/19	LH18/24-SP650_122719 12/27/19	LH18/24-SP650_123019 12/30/19
Location Description				**GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Biweekly.**						
Volatile Organic Compounds (8260C)										
1,1,1-Trichloroethane	µg/L	7,230	200	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
1,1,2-Trichloroethane	µg/L	216.9	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
1,1-Dichloroethane	µg/L	14,032	NV	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
1,1-Dichloroethene	µg/L	253	7	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U	< 0.50 U	< 0.50 U
1,2-Dichloroethane	µg/L	181	5	**1.9**	**1.5**	< 0.50 U	**1.3**	**1.5**	**1.6**	**1.5**
1,2-Dichloropropane	µg/L	5	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Acetone	µg/L	2,395	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	µg/L	181	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Carbon tetrachloride	µg/L	181	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Chlorobenzene	µg/L	47,180	100	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Chloroform	µg/L	3,615	NV	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
cis-1,2-Dichloroethene	µg/L	NV	70	**41**	**55**	**2.8**	**38**	**35**	**40**	**32**
Ethylbenzene	µg/L	57,025	700	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
m,p-Xylene	µg/L	83.6	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	1,699	5	**7.0**	**4.3**	< 1.0 U	**1.9 J**	**1.4 J**	**1.1 J**	**1.1 J**
o-Xylene	µg/L	83.6	NV	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Styrene	µg/L	5,987	100	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Tetrachloroethene	µg/L	180.7	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Toluene	µg/L	4,189	10	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Trichloroethene	µg/L	181	5	**6.8**	**9.5**	< 0.50 U	**6.8**	**5.4**	**6.5**	**4.8**
Vinyl chloride	µg/L	72	2	**0.54 J**	**0.62 J**	< 0.50 U	**0.49 J**	**0.45 J**	**0.52 J**	< 0.50 U
Anions (9056)										
Chloride	mg/L	NV	NV	**NA**	**NA**	**NA**	**425**	**457**	**NA**	**NA**
Sulfate	mg/L	NV	NV	**NA**	**NA**	**NA**	**36.5**	**27.8**	**NA**	**NA**

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

BIX - before ion exchange vessel

AIX - after ion exchange vessel

UJ - estimated non-detect due to quality control issues and reported to the limit of detection

*Discharged to Harrison Bayou

**The biweekly effluent results for Methylene chloride and Trichloroethene (TCE) exceeded the screening criteria for the INF Pond on 11/26/19 and the monthly effluent result for TCE on 12/3/19 . These samples were collected to evaluate the Ion Exchange Vessels ability to remove these contaminants and verify that the low level exceedances discharged to the INF Pond did not adversely affect the pond.

GWTP Monthly Effluent Sampling - December 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_120319* 12/3/19
Location Description				GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled monthly
Volatile Organic Compounds (8260C)				
1,1,1-Trichloroethane	µg/L	7,230	200	< 0.50 U
1,1,2-Trichloroethane	µg/L	216.9	5	< 0.50 U
1,1-Dichloroethane	µg/L	14,032	NV	< 0.50 U
1,1-Dichloroethene	µg/L	253	7	< 0.50 U
1,2-Dichloroethane	µg/L	181	5	**1.4**
1,2-Dichloropropane	µg/L	5	5	< 0.50 U
Acetone	µg/L	2,395	NV	< 1.0 U
Benzene	µg/L	181	5	< 0.50 U
Carbon tetrachloride	µg/L	181	5	< 0.50 U
Chlorobenzene	µg/L	47,180	100	< 0.50 U
Chloroform	µg/L	3,615	NV	< 0.50 U
cis-1,2-dichloroethene	µg/L	NV	70	**46**
Ethylbenzene	µg/L	57,025	700	< 0.50 U
m,p-Xylene	µg/L	83.6	NV	< 1.0 U
Methylene chloride	µg/L	1,699	5	**4.1**
o-Xylene	µg/L	83.6	NV	< 0.50 U
Styrene	µg/L	5,987	100	< 0.50 U
Tetrachloroethene	µg/L	180.7	5	< 0.50 U
Toluene	µg/L	4,189	10	< 0.50 U
Trichloroethene	µg/L	181	5	**9.3**
Vinyl chloride	µg/L	72	2	**0.65 J**
Metals (6020A)				
Barium	mg/L	2	2	**0.117 J**
Lead	mg/L	0.0046	0.015	< 0.00100 UJ
Selenium	mg/L	0.012	0.05	< 0.00250 U
Silver	mg/L	0.003	0.1	< 0.000500 UJ
Hexavalent Chromium (7196A)				
Hexavalent Chromium	mg/L	0.1244	NV	< 0.0100 U
Semi-Volatile Organic Compounds (8270D SIM)				
1,4-Dioxane	µg/L	134.2	NV	**20**

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

UJ - estimated non-detect due to quality control issues and reported to the limit of detection

*between the ion exchange vessels

NV - no value

discharged to INF pond

GWTP Monthly Influent Sampling - December 2019

Location ID: Sample Date:	Units	LH18/24-SP140_120319 12/3/19
Location Description		**GWTP – Collected from a spigot on the influent to TK-140. Sampled Monthly.**
Metals (6020A)		
Selenium	mg/L	**0.00126 J**
Silver	mg/L	< 0.000500 U
Hexavalent Chromium (7196A)		
Hexavalent Chromium	mg/L	< 0.0100 U
Perchlorate (6850)		
Perchlorate	µg/L	**11,000**

mg/L - milligrams per liter

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

GWTP Quarterly Effluent Sampling - December 2019*

Location ID: Sample Date:	Units	Daily Maximum Conc	(INF pond) MCL	LH18/24-SP650_121719 12/17/19
Location Description				GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Quarterly.
Oil and Grease (1664A)				
Oil & Grease	mg/L	15	NV	< 1.00 U
Chemical Oxygen Demand (410.4)				
Chemical Oxygen Demand	mg/L	200	NV	**22**
Volatile Organic Compounds (8260C)				
1,1,1-Trichloroethane	µg/L	7,230	200	< 0.5 U
1,1,2-Trichloroethane	µg/L	216.9	5	< 0.5 U
1,1-Dichloroethane	µg/L	14,032	NV	< 0.5 U
1,1-Dichloroethene	µg/L	253	7	< 0.5 U
1,2-Dichloroethane	µg/L	181	5	**1.5**
1,2-Dichloropropane	µg/L	5	5	< 0.5 U
Acetone	µg/L	2,395	NV	< 1.0 U
Benzene	µg/L	181	5	< 0.5 U
Carbon tetrachloride	µg/L	181	5	< 0.5 U
Chlorobenzene	µg/L	47,180	100	< 0.5 U
Chloroform	µg/L	3,615	NV	< 0.5 U
cis-1,2-dichloroethene	mg/L	NV	70	**39**
Ethylbenzene	µg/L	57,025	700	< 0.5 U
m,p-Xylene	µg/L	83.6	NV	< 1.0 U
Methylene chloride	µg/L	1,699	5	**1.7 J**
o-Xylene	µg/L	83.6	NV	< 0.5 U
Styrene	µg/L	5,987	100	< 0.5 U
Tetrachloroethene	µg/L	180.7	5	< 0.5 U
Toluene	µg/L	4,189	10	< 0.5 U
Trichloroethene	µg/L	181	5	**6.8**
Vinyl chloride	µg/L	72	2	**0.48 J**
Metals (6020A)				
Aluminum	mg/L	1.644		**0.0194**
Antimony	mg/L	NV	0.006	< 0.000500 U
Arsenic	mg/L	0.722	0.01	**0.000634 J**
Barium	mg/L	2	2	**0.0888**
Beryllium	mg/L	NV	0.004	< 0.000500 U
Cadmium	mg/L	0.0034	0.005	< 0.000500 U
Calcium	mg/L	NV	NV	**7.99**
Chromium	mg/L	0.752	0.1	**0.000428 J**
Cobalt	mg/L	11.495	NV	**0.00149 J**
Iron	mg/L	2.395	NV	**0.108 J**
Lead	mg/L	0.0046	0.015	< 0.00100 U
Magnesium	mg/L	NV	NV	**24.0**
Manganese	mg/L	15.494	NV	**0.104**

Nickel	mg/L	0.184	NV	**0.00372 J**
Potassium	mg/L	NV	NV	**1.29**
Selenium	mg/L	0.012	0.05	< 0.00250 U
Silver	mg/L	0.003	NV	< 0.000500 U
Sodium	mg/L	NV	NV	**339**
Thallium	mg/L	NV	NV	< 0.000500 U
Vanadium	mg/L	3.592	NV	< 0.00100 U
Zinc	mg/L	0.31	NV	**0.0172**
Mercury	mg/L	NV	0.002	< 0.000100 U
Anions (9056)				
Chloride	mg/L	NV	NV	**453**
Sulfate	mg/L	NV	NV	**28.8**
Semi-Volatile Organic Compounds (8270D SIM)				
1,4-Dioxane	µg/L	134.2	NV	**20.0**

µg/L - micrograms per liter

mg/L - milligrams per liter

J - estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

NV - No Value

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

*discharged to Harrison Bayou

GWTP Quarterly Influent Sampling - December 2019

Location ID: / Sample Date:	Units	LH18/24-SP140_121719 12/17/19
Location Description		GWTP – Collected from a spigot on the influent to TK-140. Sampled Quarterly.
Oil and Grease (1664A)		
Oil & Grease	mg/L	< 1.00 U
Chemical Oxygen Demand (410.4)		
Chemical Oxygen Demand	mg/L	**15**
Perchlorate (6850)		
Perchlorate	µg/L	**14,000**
Volatile Organic Compounds (8260C)		
1,1,1,2-Tetrachloroethane	µg/L	< 10 U
1,1,1-Trichloroethane	µg/L	< 10 U
1,1,2,2-Tetrachloroethane	µg/L	< 10 U
1,1,2-Trichloroethane	µg/L	< 10 U
1,1-Dichloroethane	µg/L	**8.5 J**
1,1-Dichloroethene	µg/L	< 10 U
1,1-Dichloropropene	µg/L	< 10 U
1,2,3-Trichlorobenzene	µg/L	< 10 UJ
1,2,3-Trichloropropane	µg/L	< 10 U
1,2,4-Trichlorobenzene	µg/L	< 10 U
1,2,4-Trimethylbenzene	µg/L	< 10 U
1,2-Dibromo-3-chloropropane	µg/L	< 10 U
1,2-Dibromoethane	µg/L	< 10 U
1,2-Dichlorobenzene	µg/L	< 10 U
1,2-Dichloroethane	µg/L	**43**
1,2-Dichloropropane	µg/L	< 10 U
1,3,5-Trimethylbenzene	µg/L	< 10 U
1,3-Dichlorobenzene	µg/L	< 10 U
1,3-Dichloropropane	µg/L	< 10 U
1,4-Dichlorobenzene	µg/L	< 10 U
2,2-Dichloropropane	µg/L	< 10 U
2-Butanone	µg/L	< 20 U
2-Chlorotoluene	µg/L	< 10 U
2-Hexanone	µg/L	< 20 U
4-Chlorotoluene	µg/L	< 10 U
4-Isopropyltoluene	µg/L	< 10 U
4-Methyl-2-pentanone	µg/L	< 20 U
Acetone	µg/L	< 20 U
Benzene	µg/L	< 10 U
Bromobenzene	µg/L	< 10 U
Bromochloromethane	µg/L	< 10 U
Bromodichloromethane	µg/L	< 10 U

Bromoform	µg/L	< 10 U
Bromomethane	µg/L	< 10 U
Carbon disulfide	µg/L	< 20 U
Carbon tetrachloride	µg/L	< 10 U
Chlorobenzene	µg/L	< 10 U
Chloroethane	µg/L	< 10 U
Chloroform	µg/L	< 10 U
Chloromethane	µg/L	< 10 U
cis-1,2-Dichloroethene	µg/L	**3,200**
cis-1,3-Dichloropropene	µg/L	< 10 U
Dibromochloromethane	µg/L	< 10 U
Dibromomethane	µg/L	< 10 U
Dichlorodifluoromethane	µg/L	< 10 U
Ethylbenzene	µg/L	< 10 U
Hexachlorobutadiene	µg/L	< 10 U
Isopropylbenzene	µg/L	< 10 U
m,p-Xylene	µg/L	< 20 U
Methylene chloride	µg/L	**510**
Naphthalene	µg/L	< 10 U
n-Butylbenzene	µg/L	< 10 U
n-Propylbenzene	µg/L	< 10 U
o-Xylene	µg/L	< 10 U
sec-Butylbenzene	µg/L	< 10 U
Styrene	µg/L	< 10 U
tert-Butylbenzene	µg/L	< 10 U
Tetrachloroethene	µg/L	**35**
Toluene	µg/L	< 10 U
trans-1,2-Dichloroethene	µg/L	**12 J**
trans-1,3-Dichloropropene	µg/L	< 10 U
Trichloroethene	µg/L	**5,400**
Trichlorofluoromethane	µg/L	< 10 U
Vinyl chloride	µg/L	**130**
Metals (6020A)		
Aluminum	mg/L	**0.0275**
Antimony	mg/L	< 0.000500 U
Arsenic	mg/L	**0.000872 J**
Barium	mg/L	**0.766**
Beryllium	mg/L	< 0.000500 U
Cadmium	mg/L	**0.000223 J**
Calcium	mg/L	**44.3**
Chromium	mg/L	**0.00121 J**
Cobalt	mg/L	**0.00820**
Iron	mg/L	**0.478**
Lead	mg/L	< 0.00100 U
Magnesium	mg/L	**34.2**
Manganese	mg/L	**0.542**

Nickel	mg/L	**0.0146**
Potassium	mg/L	**1.21**
Selenium	mg/L	< 0.00250 U
Silver	mg/L	< 0.000500 U
Sodium	mg/L	**211**
Thallium	mg/L	**0.000326 J**
Vanadium	mg/L	< 0.00100 U
Zinc	mg/L	**0.0549**
Mercury	mg/L	< 0.000100 U
Anions (9056)		
Chloride	mg/L	**446**
Sulfate	mg/L	**26.6**
Semi-Volatile Organic Compounds (8270D SIM)		
1,4-Dioxane	µg/L	**20**

µg/L - micrograms per liter

mg/L - milligrams per liter

J -estimated value between the detection limit and limit of quantitation and/or due to quality contol issues

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/ PCL	AWD1_121319 12/13/19	AWD3_121319 12/13/19	AWD3_121319-a 12/13/19	AWD4_121119 12/11/19	18CPTMW01SW_121319 12/13/19	18CPTMW03SW_121119 12/11/19	18CPTMW04_121719 12/17/19	18CPTMW04SW_121719 12/17/19
Lab Package			HS19120844	HS19120843	HS19120843	HS19120696	HS19120844	HS19120702	HS19121036	HS19121036
Well ID			AWD-1	AWD-3	AWD-3	AWD-4	18CPTMW01SW	18CPTMW03SW	18CPTMW04	18CPTMW04SW
Aquifer Zone:			Shallow	Shallow	Shallow	Shallow	Wilcox	Wilcox	Wilcox	Wilcox
Perchlorate (6850)										
Perchlorate	µg/L	17*	**1.4 J**	**32**	**29**	**410**	< 2.0 U	**9.1**	**520**	**1.1 J**
Volatile Organic Compounds (8260C)										
1,1,1,2-Tetrachloroethane	µg/L	110	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	7	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloropropene	µg/L	2.9	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2,3-Trichloropropane	µg/L	0.041	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	NA	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	NA	**1.5**	**1.5**	< 0.5 U	< 0.5 U	**1.2**	**1.1**	< 0.5 U
1,2-Dichloropropane	µg/L	5	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	µg/L	5	NA	< 0.5 U	< 0.5 U	< 0.5 U	**3.6**	**2.0**	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	NA	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	NA	**8.4**	**8.5**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	NA	**0.97 J**	**0.99 J**	< 0.5 U	< 0.5 U	< 0.5 U	**0.84 J**	< 0.5 U
Chloromethane	µg/L	220	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	NA	**6.8**	**6.9**	< 0.5 U	**110**	**8.1**	**19**	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Hexachlorobutadiene	µg/L	20	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Isopropylbenzene	µg/L	10,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000**	NA	< 1.0 U	< 1.0 U	< 1.0 U	**0.73 J**	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	NA	< 1.0 U	< 1.0 U	< 1.0 U	**10**	< 1.0 U	< 1.0 U	< 1.0 U
Naphthalene	µg/L	2,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

LHAAP-18/24 Analytical Results - December 2019

Location ID: Sample Date:	Units	MCL/MSC/ PCL	AWD1_121319 12/13/19	AWD3_121319 12/13/19	AWD3_121319-a 12/13/19	AWD4_121119 12/11/19	18CPTMW01SW_121319 12/13/19	18CPTMW03SW_121119 12/11/19	18CPTMW04_121719 12/17/19	18CPTMW04SW_121719 12/17/19
n-Propylbenzene	µg/L	4,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000**	NA	< 0.5 U	< 0.5 U	< 0.5 U	0.57 J	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	NA	1.1	1.0	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	2.2	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	NA	< 0.5 U	< 0.5 U	< 0.5 U	0.60 J	0.66 J	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	NA	230	220	0.65 J	64	13	660	0.82 J
Trichlorofluoromethane	µg/L	31,000	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride	µg/L	2	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Metals (6020A)										
Aluminum	mg/L	100	4.91	0.164 J	0.105 J	0.692	0.0105 UB	0.0241	NA	0.0524
Antimony	mg/L	0.006	0.00119 J	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	0.000691 J	NA	< 0.000500 U
Arsenic	mg/L	0.01	0.0181	0.000581 J	0.000503 J	< 0.000500 U	0.0145	0.00162 J	NA	0.00167 J
Barium	mg/L	2	0.359	0.0350	0.0351	0.213	1.20	0.156	NA	0.680
Beryllium	mg/L	0.004	0.000427 J	< 0.000500 U	< 0.000500 U	0.000204 J	< 0.000500 U	< 0.000500 U	NA	< 0.000500 U
Cadmium	mg/L	0.005	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	NA	< 0.000500 U
Calcium	mg/L	NV	2.99	0.856	0.855	7.56	35.4	14.0	NA	24.2
Chromium	mg/L	0.1	0.0162	0.696	0.638	0.0998	0.000961 J	0.0174	NA	0.00722
Cobalt	mg/L	6.1	0.00921	0.00622	0.00617	0.00793	0.000350 J	0.00235 J	NA	0.00212 J
Copper	mg/L	1.3	0.00380 J	0.00578	0.00553	0.00868	< 0.00250 U	< 0.00250 U	NA	< 0.00250 U
Iron	mg/L	NV	8.27	2.32	2.16	2.45	65.1	0.477 UB	NA	4.45
Lead	mg/L	0.015	0.00334 J	< 0.00100 U	< 0.00100 U	0.000644 J	< 0.00100 U	< 0.00100 U	NA	< 0.00100 U
Magnesium	mg/L	NV	3.68	0.572	0.554	5.12	24.4	9.84	NA	14.7
Manganese	mg/L	1.1*	0.273	0.0510	0.0497	0.0714	0.666	0.0209	NA	0.196
Nickel	mg/L	0.49*	0.0195	0.341	0.340	0.417	0.00104 J	0.00808	NA	0.00408 J
Potassium	mg/L	NV	3.30	0.639	0.624	0.360	13.0	234	NA	57.0
Selenium	mg/L	0.05	0.00445 J	0.00549	0.00484 J	< 0.00250 U	< 0.00250 U	< 0.00250 U	NA	< 0.00250 U
Silver	mg/L	0.51	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	NA	< 0.000500 U
Sodium	mg/L	NV	105	32.1	31.3	46.7	122	278	NA	105
Thallium	mg/L	0.002	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	NA	< 0.000500 U
Vanadium	mg/L	0.72	0.00878	0.00278 J	0.00272 J	0.00331 J	< 0.00100 U	< 0.00100 U	NA	< 0.00100 U
Zinc	mg/L	31	0.0165	0.00274 J	0.00330 J	0.00835	0.00328 J	0.00605	NA	0.0153
Mercury	mg/L	0.002	< 0.000100 U	< 0.000100 U	< 0.000100 U	0.0000530 J	< 0.000100 U	< 0.000100 U	NA	< 0.000100 U
1,4-Dioxane (8270D SIM)										
1,4-Dioxane	µg/L	9.1*	< 0.010 U	NA	NA	< 0.010 U	0.19	2.3	2.8	1.6

Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

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.

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

UB - considered a non-detect due to blank contamination

NV - No Value

*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

** Value is for total xylenes

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

a - duplicate sample

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/ PCL	18CPTMW06_121119 12/11/19	18CPTMW07_121219 12/12/19	18CPTMW08SW_121319 12/13/19	18CPTMW08DW_121319 12/13/19	18CPTMW10SW_120619 12/06/19	18CPTMW10DW_120619 12/06/19	18CPTMW12SW_120619 12/06/19
Lab Package			HS19120702	HS19120765	HS19120843	HS19120843	HS19120386	HS19120386	HS19120386
Well ID			18CPTMW06	18CPTMW07	18CPTMW08SW	18CPTMW08DW	18CPTMW10SW	18CPTMW10DW	18CPTMW12SW
Aquifer Zone:			Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox
Perchlorate (6850)									
Perchlorate	µg/L	17*	< 2.0 U	< 2.0 U	**24,000**	**310**	< 2.0 U	**10**	< 2.0 U
Volatile Organic Compounds (8260C)									
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	< 0.5 U	**3.7**	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	7	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 UJ
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 UJ	NA	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	**0.59 J**	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 UJ	< 1.0 U	< 1.0 UJ	NA	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 UJ
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	< 0.5 U	< 0.5 U	**11**	NA	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000**	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	**1.4 J**	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U
Naphthalene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/ PCL	18CPTMW06_121119 12/11/19	18CPTMW07_121219 12/12/19	18CPTMW08SW_121319 12/13/19	18CPTMW08DW_121319 12/13/19	18CPTMW10SW_120619 12/06/19	18CPTMW10DW_120619 12/06/19	18CPTMW12SW_120619 12/06/19
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000**	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	**1.3**	< 0.5 U	**42**	NA	**0.92 J**	**1.4**	**1.3**
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride	µg/L	2	< 0.5 U	< 0.5 U	**2.7**	NA	< 0.5 U	< 0.5 U	< 0.5 U
Metals (6020A)									
Aluminum	mg/L	100	NA	NA	NA	NA	NA	0.0297 UB	0.0145 UB
Antimony	mg/L	0.006	NA	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U
Arsenic	mg/L	0.01	NA	NA	NA	NA	NA	**0.00194 J**	**0.000792 J**
Barium	mg/L	2	NA	NA	NA	NA	NA	**0.124**	**0.815**
Beryllium	mg/L	0.004	NA	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U
Cadmium	mg/L	0.005	NA	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U
Calcium	mg/L	NV	NA	NA	NA	NA	NA	**10.5**	**63.3**
Chromium	mg/L	0.1	NA	NA	NA	NA	NA	**0.00929**	**0.00725**
Cobalt	mg/L	6.1	NA	NA	NA	NA	NA	**0.000146 J**	**0.00232 J**
Copper	mg/L	1.3	NA	NA	NA	NA	NA	< 0.0250 U	< 0.00250 U
Iron	mg/L	NV	NA	NA	NA	NA	NA	**1.23**	**0.776**
Lead	mg/L	0.015	NA	NA	NA	NA	NA	< 0.00100 U	< 0.00100 U
Magnesium	mg/L	NV	NA	NA	NA	NA	NA	**4.55**	**35.2**
Manganese	mg/L	1.1*	NA	NA	NA	NA	NA	**0.0295**	**0.379**
Nickel	mg/L	0.49*	NA	NA	NA	NA	NA	**0.00120 J**	**0.00624**
Potassium	mg/L	NV	NA	NA	NA	NA	NA	**85.7**	**41.3**
Selenium	mg/L	0.05	NA	NA	NA	NA	NA	< 0.00250 U	< 0.00250 U
Silver	mg/L	0.51	NA	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U
Sodium	mg/L	NV	NA	NA	NA	NA	NA	**179**	**232**
Thallium	mg/L	0.002	NA	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U
Vanadium	mg/L	0.72	NA	NA	NA	NA	NA	< 0.00100 U	< 0.00100 U
Zinc	mg/L	31	NA	NA	NA	NA	NA	**0.00373 J**	**0.0122**
Mercury	mg/L	0.002	NA	NA	NA	NA	NA	< 0.000100 U	< 0.000100 U
1,4-Dioxane (8270D SIM)									
1,4-Dioxane	µg/L	9.1*	**0.055**	**1.3**	**3**	**0.31**	< 0.010 U	NA	**0.14**

Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

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.

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

UB - considered a non-detect due to blank contamination

NV - No Value

*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

** Value is for total xylenes

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

LHAAP-18/24 Analytical Results - December 2019

Location ID: Sample Date:	Units	MCL/MSC/ PCL	18CPTMW12DW_120619 12/06/19	18CPTMW14_120919 12/09/19	18CPTMW15_121119 12/11/19	18CPTMW16_121319 12/13/19	18CPTMW18_121119 12/11/19	18CPTMW19_121119 12/11/19	18CPTMW22R_120519 12/05/19	18CPTMW22SW_120519 12/05/19
Lab Package			HS19120386	HS19120544	HS19120696	HS19120843	HS19120696	HS19120696	HS19120354	HS19120354
Well ID			18CPTMW12DW	18CPTMW14	18CPTMW15	18CPTMW16	18CPTMW18	18CPTMW19	18CPTMW22R	18CPTMW22SW
Aquifer Zone:			Wilcox	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Wilcox
Perchlorate (6850)										
Perchlorate	µg/L	17*	< 2.0 U	**2,600**	**2.5 J**	< 2.0 U	< 2.0 U	**27**	< 2.0 U	**33**
Volatile Organic Compounds (8260C)										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	7	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 UJ	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	< 0.5 U	**3.3**	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	µg/L	5	< 0.5 U	**2.6**	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 UJ	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 U	< 1.0 U	< 1.0 UJ	NA	< 1.0 UJ	< 1.0 UJ	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	**11**	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	< 0.5 U	**22**	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000**	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Naphthalene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/ PCL	18CPTMW12DW_120619 12/06/19	18CPTMW14_120919 12/09/19	18CPTMW15_121119 12/11/19	18CPTMW16_121319 12/13/19	18CPTMW18_121119 12/11/19	18CPTMW19_121119 12/11/19	18CPTMW22R_120519 12/05/19	18CPTMW22SW_120519 12/05/19
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000**	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	**1.5**	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	< 0.5 U	**970**	**1.7**	NA	< 0.5 U	< 0.5 U	< 0.5 U	**1.5**
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride	µg/L	2	< 0.5 U	< 0.5 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Metals (6020A)										
Aluminum	mg/L	100	0.0121 UB	**0.125**	NA	NA	0.0128 UB	NA	**22.4**	**0.0584**
Antimony	mg/L	0.006	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U	NA	< 0.000500 U	< 0.000500 U
Arsenic	mg/L	0.01	**0.00304 J**	**0.00169 J**	NA	NA	**0.00125 J**	NA	**0.000937 J**	**0.00197 J**
Barium	mg/L	2	**0.0892**	**5.74**	NA	NA	**0.686**	NA	**0.0563**	**0.0995**
Beryllium	mg/L	0.004	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U	NA	**0.000311 J**	< 0.000500 U
Cadmium	mg/L	0.005	< 0.000500 U	**0.000245 J**	NA	NA	**0.000346 J**	NA	< 0.000500 U	< 0.000500 U
Calcium	mg/L	NV	**6.13**	**486**	NA	NA	**241**	NA	**0.579**	**13.4**
Chromium	mg/L	0.1	**0.00294 J**	**0.00510**	NA	NA	**0.00161 J**	NA	**0.00195 J**	**0.0100**
Cobalt	mg/L	6.1	< 0.000500 U	**0.00966**	NA	NA	**0.0159**	NA	**0.00610**	< 0.000500 U
Copper	mg/L	1.3	< 0.00250 U	< 0.002500 U	NA	NA	< 0.00250 U	NA	**0.00200 J**	< 0.00250 U
Iron	mg/L	NV	**0.873**	**0.926**	NA	NA	0.802 UB	NA	**2.03**	**0.0392 J**
Lead	mg/L	0.015	< 0.00500	< 0.00100 U	NA	NA	< 0.00100 U	NA	**0.00129 J**	< 0.00100 U
Magnesium	mg/L	NV	**3.74**	**130**	NA	NA	**183**	NA	**0.689**	**4.52**
Manganese	mg/L	1.1*	**0.0237**	**0.514**	NA	NA	**2.03**	NA	**0.0484**	**0.0157**
Nickel	mg/L	0.49*	< 0.00100 U	**0.00637**	NA	NA	**0.0148**	NA	**0.00260 J**	**0.000611 J**
Potassium	mg/L	NV	**70.8**	**15.6**	NA	NA	**2.99**	NA	**0.265**	**281**
Selenium	mg/L	0.05	< 0.00250 U	< 0.002500 U	NA	NA	< 0.00250 U	NA	< 0.00250 U	< 0.00250 U
Silver	mg/L	0.51	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U	NA	< 0.000500 U	< 0.000500 U
Sodium	mg/L	NV	**163**	**567**	NA	NA	**667**	NA	**18.3**	**280**
Thallium	mg/L	0.002	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U	NA	**0.000661 J**	< 0.000500 U
Vanadium	mg/L	0.72	< 0.00100 U	**0.000939 J**	NA	NA	**0.00113 J**	NA	**0.00386 J**	**0.000853 J**
Zinc	mg/L	31	< 0.00250 U	**0.00617**	NA	NA	**0.0270**	NA	**0.00834**	**0.0139**
Mercury	mg/L	0.002	< 0.000100 U	< 0.000100 U	NA	NA	< 0.000100 U	NA	< 0.000100 U	< 0.000100 U
1,4-Dioxane (8270D SIM)										
1,4-Dioxane	µg/L	9.1*	**0.36**	**0.22**	< 0.010 U	**0.18**	NA	< 0.010 U	< 0.010 U	**2.5**

Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

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.

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

UB - considered a non-detect due to blank contamination

NV - No Value

*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

** Value is for total xylenes

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/PCL	18CPTMW23_120919 12/09/19	18CPTMW24_121219 12/12/19	18WW02_120919 12/09/19	18WW06_120919 12/09/19	18WW08_121119 12/11/19	18WW10_120919 12/09/19	18WW17_120619 12/06/19	18WW22_121219 12/12/19	18WW22_121219_a 12/12/19
Lab Package			HS19120544	HS19120765	HS19120544	HS19120544	HS19120696	HS19120544	HS19120386	HS19120765	HS19120765
Well ID			18CPTMW23	18CPTMW24	18WW02	18WW06	18WW08	18WW10	18WW17	18WW22	18WW22
Aquifer Zone:			Shallow	Shallow	Wilcox	Wilcox	Shallow	Shallow	Wilcox	Shallow	Shallow
Perchlorate (6850)											
Perchlorate	µg/L	17*	**73**	**11 J**	< 2.0 U	< 2.0 U	**3,200**	< 2.0 U	**74,000**	< 2.0 U	< 2.0 U
Volatile Organic Compounds (8260C)											
1,1,1,2-Tetrachloroethane	µg/L	110	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	7	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U
1,1-Dichloropropene	µg/L	2.9	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	**140**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 10 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 10 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 10 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	< 10 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	µg/L	5	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U
Carbon disulfide	µg/L	10,000	< 10 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U
Chloroform	µg/L	1,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	**220**	**26**	< 0.5 U	< 0.5 U	**1.3**	< 0.5 U	**0.74 J**	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U
Ethylbenzene	µg/L	700	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Hexachlorobutadiene	µg/L	20	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Isopropylbenzene	µg/L	10,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000**	< 10 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	< 10 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Naphthalene	µg/L	2,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

LHAAP-18/24 Analytical Results - December 2019

Location ID: Sample Date:	Units	MCL/MSC/ PCL	18CPTMW23_120919 12/09/19	18CPTMW24_121219 12/12/19	18WW02_120919 12/09/19	18WW06_120919 12/09/19	18WW08_121119 12/11/19	18WW10_120919 12/09/19	18WW17_120619 12/06/19	18WW22_121219 12/12/19	18WW22_121219_a 12/12/19
n-Propylbenzene	µg/L	4,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000**	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	**2,800**	**8.8**	< 0.5 U	< 0.5 U	**3.2**	< 0.5 U	**39**	< 0.5 U	< 0.5 U
Trichlorofluoromethane	µg/L	31,000	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U
Vinyl chloride	µg/L	2	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U
Metals (6020A)											
Aluminum	mg/L	100	NA	0.00631 UB	**0.268**	NA	NA	NA	0.00775 UB	**0.537**	**0.548**
Antimony	mg/L	0.006	NA	< 0.000500 U	< 0.000500 U	NA	NA	NA	< 0.000500 U	**0.000417 J**	< 0.000500 U
Arsenic	mg/L	0.01	NA	**0.00791**	**0.000627 J**	NA	NA	NA	**0.000411 J**	**0.00476 J**	**0.00499 J**
Barium	mg/L	2	NA	**11.7**	**0.0407**	NA	NA	NA	**3.28**	**0.0862**	**0.0898**
Beryllium	mg/L	0.004	NA	< 0.000500 U	< 0.000500 U	NA	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Cadmium	mg/L	0.005	NA	< 0.000500 U	< 0.000500 U	NA	NA	NA	**0.000392 J**	< 0.000500 U	< 0.000500 U
Calcium	mg/L	NV	NA	**427**	**6.86**	NA	NA	NA	**326**	**22.8**	**23.7**
Chromium	mg/L	0.1	NA	**0.000465 J**	**0.0104**	NA	NA	NA	**0.0411**	**0.0309**	**0.0318**
Cobalt	mg/L	6.1	NA	**0.00358 J**	**0.000280 J**	NA	NA	NA	**0.00213 J**	**0.000444 J**	**0.000409 J**
Copper	mg/L	1.3	NA	< 0.00250 U	**0.00499 J**	NA	NA	NA	**0.00515**	**0.00117 J**	**0.00104 J**
Iron	mg/L	NV	NA	**8.69**	**1.87**	NA	NA	NA	**0.548**	0.241 UB	0.0233 UB
Lead	mg/L	0.015	NA	< 0.00100 U	**0.000841 J**	NA	NA	NA	< 0.00100 U	< 0.00100 U	< 0.00100 U
Magnesium	mg/L	NV	NA	**286**	**1.22**	NA	NA	NA	**215**	**0.198 J**	**0.201**
Manganese	mg/L	1.1*	NA	**0.668**	**0.0860**	NA	NA	NA	**0.0461**	0.00292 UB	0.00125 UB
Nickel	mg/L	0.49*	NA	**0.00536**	**0.00775**	NA	NA	NA	**0.134**	< 0.00100 U	< 0.00100 U
Potassium	mg/L	NV	NA	**3.19**	**1.78**	NA	NA	NA	**1.55**	**6.11**	**6.33**
Selenium	mg/L	0.05	NA	< 0.00250 U	< 0.00250 U	NA	NA	NA	**0.00236 J**	**0.00124 J**	**0.00184 J**
Silver	mg/L	0.51	NA	< 0.000500 U	< 0.000500 U	NA	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Sodium	mg/L	NV	NA	**1120**	**23.7**	NA	NA	NA	**1060**	**59.9**	**62.5**
Thallium	mg/L	0.002	NA	< 0.000500 U	< 0.000500 U	NA	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Vanadium	mg/L	0.72	NA	**0.00122 J**	**0.00222 J**	NA	NA	NA	**0.00186 J**	**0.0458**	**0.0483**
Zinc	mg/L	31	NA	**0.00658**	**0.00466 J**	NA	NA	NA	**0.0183**	< 0.00250 U	< 0.00250 U
Mercury	mg/L	0.002	NA	< 0.000100 U	< 0.000100 U	NA	NA	NA	< 0.000100 U	< 0.000100 U	< 0.000200
1,4-Dioxane (8270D SIM)											
1,4-Dioxane	µg/L	9.1*	**15**	**1.3**	< 0.010 U	< 0.010 U	**0.12**	< 0.010 U	NA	**0.92**	**0.9**

Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

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.

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

UB - considered a non-detect due to blank contamination

NV - No Value

*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

** Value is for total xylenes

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/ PCL	18WW24_121119 12/11/19	CO3_121119 12/11/19	CO8_121219 12/12/19	CO9_121719 12/17/19	MW2_121319 12/13/19	MW2_121319-a 12/13/19	MW3_121219 12/12/19	MW5_121319 12/13/19	MW7_120619 12/06/19	MW8_120519 12/05/19	MW9_120519 12/05/19
Lab Package			HS19120696	HS19120696	HS19120765	HS19121036	HS19120844	HS19120844	HS19120765	HS19120843	HS19120386	HS19120354	HS19120354
Well ID			18WW24	C-03	C-08	C-09	MW-2	MW-2	MW-3	MW-5	MW-7	MW-8	MW-9
Aquifer Zone:			Shallow	Wilcox	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Perchlorate (6850)													
Perchlorate	µg/L	17*	< 2.0 U	**15**	< 2.0 U	**1.5 J**	< 2.0 U	< 2.0 U	**15,000**	**32,000**	**25,000**	**4,100**	**320**
Volatile Organic Compounds (8260C)													
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**21 J**	< 25 U	**4.3**	**3.0**	**0.49 J**	< 0.5 U	**0.52 J**
1,1-Dichloroethene	µg/L	7	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	**83**	**70**	< 0.5 U	< 0.5 U	**14**	< 0.5 U	**1.5**
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 25 UJ	< 25 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	**30**	**1.7**	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 50 U	< 50 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 50 U	< 50 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 50 U	< 50 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 50 U	< 50 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	**6.3**	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**72**	**60**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 25 U	< 25 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 UJ	< 1.0 UJ	< 1.0 U	< 1.0 U	< 50 UJ	< 50 UJ	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	**6.0**	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 25 U	< 25 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**30 J**	**31 J**	**1.3**	< 0.5 U	**19**	< 0.5 U	**0.92 J**
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 25 U	< 25 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**21,000**	**20,000**	**65**	**10**	**28**	**15**	**20**
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 25 U	< 25 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 50 U	< 50 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 50 U	< 50 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**42,000**	**41,000**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Naphthalene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/PCL	18WW24_121119 12/11/19	CO3_121119 12/11/19	CO8_121219 12/12/19	CO9_121719 12/17/19	MW2_121319 12/13/19	MW2_121319-a 12/13/19	MW3_121219 12/12/19	MW5_121319 12/13/19	MW7_120619 12/06/19	MW8_120519 12/05/19	MW9_120519 12/05/19
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	**1.2**	< 0.5 U	**0.75 J**	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**34 J**	**30 J**	**3.2**	< 0.5 U	**0.46 J**	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 25 U	< 25 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	< 0.5 U	< 0.5 U	**2.0**	< 0.5 U	**4,800**	**4,400**	**360**	**40**	**3,200**	**180**	**760**
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 25 U	< 25 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride	µg/L	2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 25 U	< 25 U	**25**	**3.0 J**	**1.8**	< 0.5 U	< 0.5 U
Metals (6020A)													
Aluminum	mg/L	100	**0.0872**	NA	**0.0286**	**0.149**	**0.0283**	**0.0314**	0.00215 UB	0.00447 UB	NA	NA	0.0208 UB
Antimony	mg/L	0.006	< 0.000500 U	NA	< 0.000500 U	< 0.000500 U	**0.000434 J**	< 0.000500 U	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U
Arsenic	mg/L	0.01	**0.00123 J**	NA	< 0.000500 U	< 0.000500 U	**0.0440**	**0.0431**	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U
Barium	mg/L	2	**0.0733**	NA	**4.53**	**0.948**	**2.62**	**2.57**	**0.614**	**0.977**	NA	NA	**0.0605**
Beryllium	mg/L	0.004	**0.000558 J**	NA	< 0.000500 U	< 0.000500 U	**0.000362 J**	**0.000394 J**	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U
Cadmium	mg/L	0.005	**0.000487 J**	NA	**0.000401 J**	**0.000207 J**	**0.000329 J**	**0.000495 J**	**0.000342 J**	**0.000789 J**	NA	NA	< 0.000500 U
Calcium	mg/L	NV	**29.4**	NA	**261**	**236**	**80.5**	**77.1**	**33.1**	**23.1**	NA	NA	**5.82**
Chromium	mg/L	0.1	**0.000461 J**	NA	< 0.000500 U	**0.00256 J**	**0.0216**	**0.0200**	**0.000982 J**	**0.0330**	NA	NA	**0.138**
Cobalt	mg/L	6.1	**0.00579**	NA	**0.00355 J**	**0.00104 J**	**0.109**	**0.107**	**0.00483 J**	**0.00353 J**	NA	NA	**0.00128 J**
Copper	mg/L	1.3	**0.00152 J**	NA	< 0.00250 U	< 0.00250 U	**0.00306 J**	**0.00301 J**	< 0.00250 U	< 0.00250 U	NA	NA	< 0.00250 U
Iron	mg/L	NV	0.0979 UB	NA	0.558 UB	**0.159 J**	**36.4**	**35.6**	0.343 UB	0.127 UB	NA	NA	**0.864**
Lead	mg/L	0.015	< 0.00100 U	NA	< 0.00100 U	< 0.00100 U	< 0.00100 U	< 0.00100 U	< 0.00100 U	< 0.00100 U	NA	NA	< 0.00100 U
Magnesium	mg/L	NV	**24.0**	NA	**168**	**79.1**	**59.0**	**58.2**	**20.6**	**24.8**	NA	NA	**1.95**
Manganese	mg/L	1.1*	**2.09**	NA	**0.452**	**0.169**	**6.09**	**6.27**	**2.47**	**0.0984**	NA	NA	**0.0324**
Nickel	mg/L	0.49*	**0.108**	NA	**0.00153 J**	**0.0250**	**0.0628**	**0.0612**	**0.00606**	**0.0630**	NA	NA	**0.00604**
Potassium	mg/L	NV	**0.604**	NA	**1.96**	**0.977**	**2.96**	**2.98**	**1.76**	**2.30**	NA	NA	**0.396**
Selenium	mg/L	0.05	< 0.00250 U	NA	< 0.00250 U	< 0.00250 U	< 0.00250 U	< 0.00250 U	< 0.00250 U	< 0.00250 U	NA	NA	< 0.00250 U
Silver	mg/L	0.51	< 0.000500 U	NA	< 0.000500 U	< 0.000500 UJ	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U
Sodium	mg/L	NV	**567**	NA	**717**	**256**	**220**	**217**	**292**	**129**	NA	NA	**13.2**
Thallium	mg/L	0.002	**0.000536 J**	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	< 0.000500 U	NA	NA	< 0.000500 U
Vanadium	mg/L	0.72	**0.00129 J**	NA	**0.000998 J**	< 0.00100 U	**0.00191 J**	**0.00150 J**	**0.000932 J**	**0.00147 J**	NA	NA	**0.000987 J**
Zinc	mg/L	31	**0.0483**	NA	**0.00604**	0.00734 UB	**0.148**	**0.142**	**0.00550**	**0.0222**	NA	NA	**0.00680**
Mercury	mg/L	0.002	< 0.000100 U	NA	< 0.000100 U	< 0.000100 U	< 0.000100 U	< 0.000100 U	< 0.000100 U	< 0.000100 U	NA	NA	< 0.000100 U
1,4-Dioxane (8270D SIM)													
1,4-Dioxane	µg/L	9.1*	NA	**0.054**	**1.2**	NA	**5.7**	**7.1**	NA	**1.6**	**42**	**2.9**	**0.71**

Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

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.

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

UB - considered a non-detect due to blank contamination

NV - No Value

*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

** Value is for total xylenes

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

LHAAP-18/24 Analytical Results - December 2019

Location ID: Sample Date:	Units	MCL/MSC/ PCL	MW10_120519 12/05/19	MW14_121719 12/17/19	MW16_120919 12/09/19	MW17_120519 12/05/19	MW18_121719 12/17/19	MW19_120919 12/09/19	MW20_120519 12/05/19	MW20_120519-a 12/05/19	MW21_121119 12/11/19	MW21_121119-a 12/11/19	MW22_121119 12/11/19
Lab Package			HS19120354	HS19121036	HS19120544	HS19120354	HS19121036	HS19120544	HS19120354	HS19120354	HS19120702	HS19120702	HS19120702
Well ID			MW-10	MW-14	MW-16	MW-17	MW-18	MW-19	MW-20	MW-20	MW-21	MW-21	MW-22
Aquifer Zone:			Shallow	Wilcox	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Perchlorate (6850)													
Perchlorate	μg/L	17*	< 2.0 U	**130,000**	**1.8 J**	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	**13,000**	**13,000**	**210**
Volatile Organic Compounds (8260C)													
1,1,1,2-Tetrachloroethane	μg/L	110	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,1,1-Trichloroethane	μg/L	200	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,1,2,2-Tetrachloroethane	μg/L	14	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,1,2-Trichloroethane	μg/L	5	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**6.6 J**	**6.1 J**	< 0.5 U
1,1-Dichloroethane	μg/L	10,000	< 0.5 U	**26**	**1.4**	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,1-Dichloroethene	μg/L	7	< 0.5 U	**87**	**6.1**	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,1-Dichloropropene	μg/L	2.9	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2,3-Trichlorobenzene	μg/L	310	< 0.5 U	< 12 UJ	< 0.5 U	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2,3-Trichloropropane	μg/L	0.041	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2,4-Trichlorobenzene	μg/L	70	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2,4-Trimethylbenzene	μg/L	5,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2-Dibromo-3-chloropropane	μg/L	0.2	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2-Dibromoethane	μg/L	0.05	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2-Dichlorobenzene	μg/L	600	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,2-Dichloroethane	μg/L	5	< 0.5 U	**73**	**43**	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**19**	**19**	**4.3**
1,2-Dichloropropane	μg/L	5	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,3,5-Trimethylbenzene	μg/L	5,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,3-Dichlorobenzene	μg/L	3,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,3-Dichloropropane	μg/L	29	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
1,4-Dichlorobenzene	μg/L	75	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
2,2-Dichloropropane	μg/L	42	< 0.5 U	< 12 U	< 0.5 UJ	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
2-Butanone	μg/L	61,000	< 1.0 U	< 25 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 U	< 10 U	< 1.0 U
2-Chlorotoluene	μg/L	2,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
2-Hexanone	μg/L	6,100	< 1.0 U	< 25 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 U	< 10 U	< 1.0 U
4-Chlorotoluene	μg/L	2,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
4-Isopropyltoluene	μg/L	10,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
4-Methyl-2-pentanone	μg/L	8,200	< 1.0 U	< 25 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 U	< 10 U	< 1.0 U
Acetone	μg/L	92,000	< 1.0 U	< 25 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 U	< 10 U	< 1.0 U
Benzene	μg/L	5	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	**0.89 J**
Bromobenzene	μg/L	2,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Bromochloromethane	μg/L	4,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Bromodichloromethane	μg/L	4.6	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Bromoform	μg/L	36	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Bromomethane	μg/L	140	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Carbon disulfide	μg/L	10,000	< 1.0 U	< 25 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 UJ	< 10 UJ	< 1.0 UJ
Carbon tetrachloride	μg/L	5	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Chlorobenzene	μg/L	100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Chloroethane	μg/L	41,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Chloroform	μg/L	1,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**6.0 J**	**6.4 J**	**2.2**
Chloromethane	μg/L	220	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
cis-1,2-Dichloroethene	μg/L	70	< 0.5 U	**2,100**	**24**	NA	**0.81 J**	**2.7**	< 0.5 U	< 0.5 U	**400**	**400**	**3.2**
cis-1,3-Dichloropropene	μg/L	5.3	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Dibromochloromethane	μg/L	34	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Dibromomethane	μg/L	380	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Dichlorodifluoromethane	μg/L	20,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Ethylbenzene	μg/L	700	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Hexachlorobutadiene	μg/L	20	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 10 U	< 10 U	< 0.5 U
Isopropylbenzene	μg/L	10,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
m,p-Xylene	μg/L	10,000**	< 1.0 U	< 25 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 U	< 10 U	< 1.0 U
Methylene chloride	μg/L	5	< 1.0 U	< 25 U	< 1.0 U	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 U	< 10 U	< 1.0 U
Naphthalene	μg/L	2,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
n-Butylbenzene	μg/L	4,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U

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Location ID: / Sample Date:	Units	MCL/MSC/ PCL	MW10_120519 12/05/19	MW14_121719 12/17/19	MW16_120919 12/09/19	MW17_120519 12/05/19	MW18_121719 12/17/19	MW19_120919 12/09/19	MW20_120519 12/05/19	MW20_120519-a 12/05/19	MW21_121119 12/11/19	MW21_121119-a 12/11/19	MW22_121119 12/11/19
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
o-Xylene	µg/L	10,000**	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 12 U	< 5.0 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	**19 J**	**0.53 J**	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Trichloroethene	µg/L	5	**1.3**	**9,200**	**550**	NA	**13**	**1.2**	< 0.5 U	< 0.5 U	**3,200**	**3,200**	**240**
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 12 U	< 0.5 U	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U	< 5.0 U	< 0.5 U
Vinyl chloride	µg/L	2	< 0.5 U	< 12 U	**1.7**	NA	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**9.2 J**	**8.6 J**	< 0.5 U
Metals (6020A)													
Aluminum	mg/L	100	NA	**0.0444**	NA	NA	NA	**0.461**	NA	NA	0.00790 UB	0.00780 UB	**0.0245**
Antimony	mg/L	0.006	NA	< 0.000500 U	NA	NA	NA	< 0.000500 U	NA	NA	< 0.000500 U	< 0.000500 U	**0.000693 J**
Arsenic	mg/L	0.01	NA	**0.00751**	NA	NA	NA	**0.00705**	NA	NA	**0.000444 J**	< 0.000500 U	**0.00130 J**
Barium	mg/L	2	NA	**0.202**	NA	NA	NA	**0.547**	NA	NA	**4.46**	**4.45**	**0.897**
Beryllium	mg/L	0.004	NA	**0.000360 J**	NA	NA	NA	< 0.000500 U	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Cadmium	mg/L	0.005	NA	**0.000887 J**	NA	NA	NA	**0.000382 J**	NA	NA	**0.000516 J**	**0.000542 J**	**0.000500 J**
Calcium	mg/L	NV	NA	**87.4**	NA	NA	NA	**110**	NA	NA	**170**	**168**	**74.0**
Chromium	mg/L	0.1	NA	**0.0844**	NA	NA	NA	**0.0839**	NA	NA	**0.201**	**0.223**	**0.520**
Cobalt	mg/L	6.1	NA	**0.0415**	NA	NA	NA	**0.0106**	NA	NA	**0.0495**	**0.0497**	**0.0101**
Copper	mg/L	1.3	NA	**0.00180 J**	NA	NA	NA	**0.00372 J**	NA	NA	**0.0360**	**0.0361**	**0.0109**
Iron	mg/L	NV	NA	**101**	NA	NA	NA	**88.9**	NA	NA	**2.92**	**2.86**	**6.06**
Lead	mg/L	0.015	NA	< 0.00100 U	NA	NA	NA	< 0.00100 U	NA	NA	< 0.00100 U	< 0.00100 U	< 0.00100 U
Magnesium	mg/L	NV	NA	**51.6**	NA	NA	NA	**60.4**	NA	NA	**130**	**128**	**33.7**
Manganese	mg/L	1.1*	NA	**3.76**	NA	NA	NA	**2.23**	NA	NA	**1.60**	**1.60**	**0.257**
Nickel	mg/L	0.49*	NA	**0.112**	NA	NA	NA	**0.0736**	NA	NA	**0.549**	**0.541**	**0.283**
Potassium	mg/L	NV	NA	**10.1**	**NA**	**NA**	NA	**4.48**	NA	NA	**2.09**	**2.05**	**2.07**
Selenium	mg/L	0.05	NA	< 0.00250 U	NA	NA	NA	< 0.0250 U	NA	NA	< 0.00250 U	< 0.00250 U	< 0.00250 U
Silver	mg/L	0.51	NA	< 0.000500 U	NA	NA	NA	< 0.000500 U	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Sodium	mg/L	NV	NA	**363**	NA	NA	NA	**852**	NA	NA	**465**	**455**	**375**
Thallium	mg/L	0.002	NA	< 0.000500 U	NA	NA	NA	< 0.000500 U	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Vanadium	mg/L	0.72	NA	< 0.00100 U	NA	NA	NA	**0.00207 J**	NA	NA	**0.00186 J**	**0.00182 J**	**0.00337 J**
Zinc	mg/L	31	NA	**0.761**	NA	NA	NA	**0.0123**	NA	NA	**0.0199**	**0.0181**	**0.00329 J**
Mercury	mg/L	0.002	NA	< 0.000100 U	NA	NA	NA	< 0.000100 U	NA	NA	< 0.000100 U	< 0.000100 U	< 0.000100 U
1,4-Dioxane (8270D SIM)													
1,4-Dioxane	µg/L	9.1*	**0.13**	**390**	**23**	**0.37**	NA	NA	NA	NA	**4.9**	**4.4**	NA

Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

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.

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

UB - considered a non-detect due to blank contamination

NV - No Value

*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

** Value is for total xylenes

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

LHAAP-18/24 Analytical Results - December 2019

Location ID: Sample Date:	Units	MCL/MSC/ PCL	MW23_121219 12/12/19	MW23_121219-a 12/12/19	109_121219 12/12/19	120_121719 12/17/19	125_121219 12/12/19	126_121719 12/17/19	126_121719-a 12/17/19
Lab Package			HS19120765	HS19120765	HS19120765	HS19121036	HS19120765	HS19121036	HS19121036
Well ID			MW-23	MW-23	109	120	125	126	126
Aquifer Zone:			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Perchlorate (6850)									
Perchlorate	µg/L	17*	**73,000**	**80,000**	**1,000**	**23,000**	**1,800**	< 2.0 U	< 2.0 U
Volatile Organic Compounds (8260C)									
1,1,1,2-Tetrachloroethane	µg/L	110	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 5.0 U	< 5.0 U	**0.89 J**	**16 J**	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	7	< 5.0 U	< 5.0 U	< 0.5 U	**79**	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloropropene	µg/L	2.9	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 5.0 U	< 5.0 U	< 0.5 U	< 12 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2,3-Trichloropropane	µg/L	0.041	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	**69**	**68**	< 0.5 U	**25**	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 10 U	< 10 U	< 1.0 U	< 25 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 10 U	< 10 U	< 1.0 U	< 25 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 10 U	< 10 U	< 1.0 U	< 25 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	< 10 U	< 10 U	< 1.0 U	< 25 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	µg/L	5	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 10 UJ	< 10 UJ	< 1.0 U	< 25 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	**9.1 J**	**8.7 J**	**1.3**	**20 J**	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	**19**	**18**	**120**	**1,100**	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Hexachlorobutadiene	µg/L	20	< 10 U	< 10 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Isopropylbenzene	µg/L	10,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000**	< 10 U	< 10 U	< 1.0 U	< 25 U	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	< 10 U	< 10 U	< 1.0 U	< 25 U	< 1.0 U	< 1.0 U	< 1.0 U
Naphthalene	µg/L	2,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U

LHAAP-18/24 Analytical Results - December 2019

Location ID: / Sample Date:	Units	MCL/MSC/ PCL	MW23_121219 12/12/19	MW23_121219-a 12/12/19	109_121219 12/12/19	120_121719 12/17/19	125_121219 12/12/19	126_121719 12/17/19	126_121719-a 12/17/19
n-Propylbenzene	μg/L	4,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	μg/L	10,000**	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	μg/L	4,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	μg/L	100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	μg/L	4,100	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	μg/L	5	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	μg/L	1,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	μg/L	100	< 5.0 U	< 5.0 U	**1.4**	**10 J**	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	μg/L	29	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	μg/L	5	**3000**	**3000**	**400**	**9,200**	**0.89 J**	< 0.5 U	< 0.5 U
Trichlorofluoromethane	μg/L	31,000	< 5.0 U	< 5.0 U	< 0.5 U	< 12 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride	μg/L	2	< 5.0 U	< 5.0 U	< 0.5 U	**21 J**	< 0.5 U	< 0.5 U	< 0.5 U
Metals (6020A)									
Aluminum	mg/L	100	NA	NA	NA	NA	**0.430**	**0.0570**	**0.0507**
Antimony	mg/L	0.006	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Arsenic	mg/L	0.01	NA	NA	NA	NA	**0.000643 J**	**0.00342 J**	**0.00323 J**
Barium	mg/L	2	NA	NA	NA	NA	**0.107**	**8.65**	**8.50**
Beryllium	mg/L	0.004	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Cadmium	mg/L	0.005	NA	NA	NA	NA	< 0.000500 U	**0.000301 J**	**0.000264 J**
Calcium	mg/L	NV	NA	NA	NA	NA	**2.06**	**313**	**316**
Chromium	mg/L	0.1	NA	NA	NA	NA	**0.00167 J**	< 0.00500 U	< 0.00500 U
Cobalt	mg/L	6.1	NA	NA	NA	NA	**0.000632 J**	**0.0103**	**0.00992**
Copper	mg/L	1.3	NA	NA	NA	NA	< 0.00250 U	< 0.00250 U	< 0.00250 U
Iron	mg/L	NV	NA	NA	NA	NA	0.617 UB	**2.77**	**2.80**
Lead	mg/L	0.015	NA	NA	NA	NA	< 0.00100 U	< 0.00100 U	< 0.00100 U
Magnesium	mg/L	NV	NA	NA	NA	NA	**1.56**	**235**	**243**
Manganese	mg/L	1.1*	NA	NA	NA	NA	**0.0135**	**0.165**	**0.160**
Nickel	mg/L	0.49*	NA	NA	NA	NA	**0.00252 J**	**0.0121**	**0.0119**
Potassium	mg/L	NV	NA	NA	NA	NA	**0.676**	**3.28**	**3.23**
Selenium	mg/L	0.05	NA	NA	NA	NA	< 0.00250 U	< 0.00250 U	< 0.00250 U
Silver	mg/L	0.51	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Sodium	mg/L	NV	NA	NA	NA	NA	**43.8**	**838**	**850**
Thallium	mg/L	0.002	NA	NA	NA	NA	< 0.000500 U	< 0.000500 U	< 0.000500 U
Vanadium	mg/L	0.72	NA	NA	NA	NA	**0.00209 J**	**0.00153 J**	**0.00164 J**
Zinc	mg/L	31	NA	NA	NA	NA	**0.00554**	**0.0229**	**0.0228**
Mercury	mg/L	0.002	NA	NA	NA	NA	< 0.000100 U	**0.0000340 J**	**0.0000310 J**
1,4-Dioxane (8270D SIM)									
1,4-Dioxane	μg/L	9.1*	NA	NA	**0.7**	**48**	NA	**1.8**	**0.71**

Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

μg/L - micrograms per liter

mg/L - milligrams per liter

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.

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

UB - considered a non-detect due to blank contamination

NV - No Value

*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

** Value is for total xylenes

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

LHAAP-58 Remedial Action Operation Validated Data - December 2019

Location ID: Sample Date:	Units	MCL/MSC	03WW01_121819 12/18/19	35ASW03	35AWW01_122019 12/20/19	35AWW06_121919 12/19/19	35AWW08_121819 12/18/19	35AWW09_121819 12/18/19	35AWW10_121919 12/19/19	35AWW10_121919-a 12/19/19
Location Description			Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - ESE, inside site boundary.	Site 58 - ESE, inside site boundary. Duplicate
Location Depth			Shallow	Surface Water	Intermediate	Shallow	Shallow	Shallow	Shallow	Shallow
Frequency						Quarterly				
Lab Package			HS19121092		HS19121257	HS19121155	HS19121092	HS19121092	HS19121155	HS19121155
Total Organic Carbon (415.1/SM5310C)										
Total Organic Carbon	mg/L	NV	**92**		NA	**13.8**	**291**	**2.96**	**4.44**	**4.10**
Volatile Organic Compounds (8260C)										
1,1,1,2-Tetrachloroethane	μg/L	110	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	μg/L	200	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,1,2,2-Tetrachloroethane	μg/L	14	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,1,2-Trichloroethane	μg/L	5	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,1-Dichloroethane	μg/L	10000	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	**1.0**	< 0.5 U	< 0.5 U
1,1-Dichloroethene	μg/L	7	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,1-Dichloropropene	μg/L	2.9	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2,3-Trichlorobenzene	μg/L	310	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	μg/L	0.041	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	μg/L	70	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	μg/L	5100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2-Dibromo-3-chloropropane	μg/L	0.2	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2-Dibromoethane	μg/L	0.05	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2-Dichlorobenzene	μg/L	600	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2-Dichloroethane	μg/L	5	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,2-Dichloropropane	μg/L	5	< 0.5 U		< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,3,5-Trimethylbenzene	μg/L	5100	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	μg/L	3100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,3-Dichloropropane	μg/L	29	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
1,4-Dichlorobenzene	μg/L	75	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
2,2-Dichloropropane	μg/L	42	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
2-Butanone	μg/L	61000	< 10 U		< 1.0 UJ	< 1.0 UJ	< 10 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ
2-Chlorotoluene	μg/L	2000	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	μg/L	6100	< 10 U		< 1.0 UJ	< 1.0 UJ	< 10 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ
4-Chlorotoluene	μg/L	2000	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	μg/L	10000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
4-Methyl-2-pentanone	μg/L	8200	< 10 U		< 1.0 UJ	< 1.0 UJ	< 10 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ
Acetone	μg/L	92000	**41**		< 2.0 UJ	< 1.0 UJ	**55**	**2.1**	< 1.0 UJ	< 1.0 UJ
Benzene	μg/L	5	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Bromobenzene	μg/L	2000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Bromochloromethane	μg/L	4100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Bromodichloromethane	μg/L	4.6	< 5.0 U	Dry	< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Bromoform	μg/L	36	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Bromomethane	μg/L	140	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Carbon disulfide	μg/L	10000	< 10 U		< 1.0 UJ	< 1.0 UJ	< 10 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ
Carbon tetrachloride	μg/L	5	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Chlorobenzene	μg/L	100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Chloroethane	μg/L	41000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Chloroform	μg/L	1000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Chloromethane	μg/L	220	< 5.0 UJ		< 0.5 UJ	< 0.5 UJ	< 5.0 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
cis-1,2-Dichloroethene	μg/L	70	**14**		< 0.5 UJ	< 0.5 UJ	< 5.0 U	**1.1**	< 0.5 UJ	< 0.5 UJ
cis-1,3-Dichloropropene	μg/L	5.3	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Dibromochloromethane	μg/L	34	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Dibromomethane	μg/L	380	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Dichlorodifluoromethane	μg/L	20000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Ethylbenzene	μg/L	700	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Hexachlorobutadiene	μg/L	20	< 10 U		< 0.5 UJ	< 1.0 UJ	< 10 U	< 0.5 U	< 1.0 UJ	< 1.0 UJ
Isopropylbenzene	μg/L	10000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
m,p-Xylene	μg/L	10000	< 10 U		< 0.5 UJ	< 1.0 UJ	< 10 U	< 0.5 U	< 1.0 UJ	< 1.0 UJ
Methylene chloride	μg/L	5	< 10 U		< 0.5 UJ	< 1.0 UJ	< 10 U	< 0.5 U	< 1.0 UJ	< 1.0 UJ
n-Butylbenzene	μg/L	4100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
n-Propylbenzene	μg/L	4100	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
Naphthalene	μg/L	2000	< 5.0 U		< 0.5 U	< 0.5 U	< 5.0 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	μg/L	10000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
sec-Butylbenzene	μg/L	4100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Styrene	μg/L	100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
tert-Butylbenzene	μg/L	4100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Tetrachloroethene	μg/L	5	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	**500**	< 0.5 UJ	< 0.5 UJ
Toluene	μg/L	1000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
trans-1,2-Dichloroethene	μg/L	100	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
trans-1,3-Dichloropropene	μg/L	29	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Trichloroethene	μg/L	5	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	**160**	< 0.5 UJ	< 0.5 UJ
Trichlorofluoromethane	μg/L	31000	< 5.0 U		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Vinyl chloride		2	**5.4 J**		< 0.5 UJ	< 0.5 UJ	< 5.0 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ
Volatile Fatty Acids (HPLC-METACIDS)										
Acetic Acid	mg/L	NV	**3.1 J**		NA	< 2.0 U	**29**	< 2.0 U	< 2.0 U	< 2.0 U
Butyric Acid	mg/L	NV	< 1.0 U		NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Lactic Acid	mg/L	NV	**1.8 J**		NA	< 1.0 U	**7.7 J**	< 1.0 U	< 1.0 U	< 1.0 U
Propionic Acid	mg/L	51	< 1.0 U		NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Pyruvic Acid	mg/L	NV	< 0.10 U		NA	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U
Anions (9056A)										
Chloride	mg/L	NV	940		NA	**935**	**2,290**	**1,310**	**4.46**	**5.43**
Nitrate	mg/L	10	< 0.500 U		NA	< 0.100 U	**0.704**	< 0.500 U	**0.115**	**0.115**
Sulfate	mg/L	NV	155		NA	**0.845**	< 2.5 U	**940**	**46.1**	**46.5**
Dissolved Gases (RSK-175)										
Carbon Dioxide	μg/L	NV	**340,000**		NA	**270,000**	**240,000**	**120,000**	**210,000**	**180,000**
Ethane	μg/L	NV	< 0.47 U		NA	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U
Ethene	μg/L	NV	**0.61 J**		NA	< 0.55 U	**6.2**	< 0.55 U	< 0.55 U	< 0.55 U
Methane	μg/L	NV	**540**		NA	**1,500**	**760**	**3**	< 1.0 U	< 1.0 U
Dechlorinating Bacteria										

Location ID: Sample Date:	35AWW11_121819 12/18/19	35AWW12_121819 12/18/19	35AWW13_121819 12/18/19	35AWW14_121919 12/19/19	35AWW15_122019 12/20/19	35AWW16_121919 12/19/19	35AWW17_121819 12/18/19	35AWW18_121819 12/18/19	35AWW19_121819 12/18/19	35AWW20_121919 12/19/19
Location Description	Site 58 - SE, inside site boundary.	Site 58 - E, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - W, inside site boundary.	Site 58 - SW, outside site boundary, near Building 744-A.	Site 58 - SW, outside site boundary.	Site 58 - SSW, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary.
Location Depth	Shallow	Shallow		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Frequency	Quarterly								Quarterly	Quarterly
Lab Package	HS19121092	HS19121092	HS19121092	HS19121155	HS19121257	HS19121155	HS19121092	HS19121092	HS19121092	HS19121155
Total Organic Carbon (415.1/SM5310C)										
Total Organic Carbon	**9.94**	NA	NA	NA	NA	NA	NA	NA	**1.75**	**13.1**
Volatile Organic Compounds (8260C)										
1,1,1,2-Tetrachloroethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
1,1,1-Trichloroethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,1,2,2-Tetrachloroethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,1,2-Trichloroethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**75 J**
1,1-Dichloroethane	< 0.5 U	< 0.5 U	< 0.5 U	**9.1**	< 0.5 U	**0.65 J**	< 0.5 U	**1.2**	**0.98 J**	**640**
1,1-Dichloroethene	< 0.5 U	< 0.5 U	< 0.5 U	**15 J**	< 0.5 UJ	< 0.5 UJ	< 0.5 U	**4.1**	**4.5**	**970 J**
1,1-Dichloropropene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,2,3-Trichlorobenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
1,2,3-Trichloropropane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
1,2,4-Trichlorobenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
1,2,4-Trimethylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,2-Dibromo-3-chloropropane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,2-Dibromoethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,2-Dichlorobenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**17 J**
1,2-Dichloroethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	**1.0**	**19 J**
1,2-Dichloropropane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,3,5-Trimethylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
1,3-Dichlorobenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,3-Dichloropropane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
1,4-Dichlorobenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
2,2-Dichloropropane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
2-Butanone	**29**	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 10 UJ
2-Chlorotoluene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
2-Hexanone	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 10 UJ
4-Chlorotoluene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
4-Isopropyltoluene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
4-Methyl-2-pentanone	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 10 UJ
Acetone	**38**	< 2.0 U	< 2.0 U	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 2.0 U	< 2.0 U	< 2.0 U	< 10 UJ
Benzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**9.0 J**
Bromobenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Bromochloromethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Bromodichloromethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Bromoform	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Bromomethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Carbon disulfide	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 10 UJ
Carbon tetrachloride	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Chlorobenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Chloroethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Chloroform	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Chloromethane	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 5.0 UJ
cis-1,2-Dichloroethene	< 0.5 U	< 0.5 U	< 0.5 U	**3.7 J**	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**70 J**
cis-1,3-Dichloropropene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Dibromochloromethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Dibromomethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Dichlorodifluoromethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Ethylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Hexachlorobutadiene	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 UJ	< 0.5 UJ	< 1.0 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 10 UJ
Isopropylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
m,p-Xylene	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 UJ	< 0.5 UJ	< 1.0 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 10 UJ
Methylene chloride	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 UJ	< 0.5 UJ	< 1.0 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 10 UJ
n-Butylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
n-Propylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
Naphthalene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 U
o-Xylene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
sec-Butylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Styrene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
tert-Butylbenzene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Tetrachloroethene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Toluene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
trans-1,2-Dichloroethene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**9.1 J**
trans-1,3-Dichloropropene	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Trichloroethene	< 0.5 U	< 0.5 U	< 0.5 U	**11 J**	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**99 J**
Trichlorofluoromethane	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 5.0 UJ
Vinyl chloride	< 0.5 U	< 0.5 U	< 0.5 U	**0.75 J**	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	**2,800 J**
Volatile Fatty Acids (HPLC-METACIDS)										
Acetic Acid	**26**	NA	NA	NA	NA	NA	NA	NA	< 2.0 U	**3.1**
Butyric Acid	< 1.0 U	NA	NA	NA	NA	NA	NA	NA	< 1.0 U	< 1.0 U
Lactic Acid	< 1.0 U	NA	NA	NA	NA	NA	NA	NA	< 1.0 U	< 1.0 U
Propionic Acid	**4.1**	NA	NA	NA	NA	NA	NA	NA	< 1.0 U	< 1.0 U
Pyruvic Acid	< 0.10 U	NA	NA	NA	NA	NA	NA	NA	< 0.10 U	< 0.10 U
Anions (9056A)										
Chloride	**2,080**	NA	NA	NA	NA	NA	NA	NA	**979**	**821**
Nitrate	< 0.500 U	NA	NA	NA	NA	NA	NA	NA	< 0.500 U	< 0.100 U
Sulfate	**192**	NA	NA	NA	NA	NA	NA	NA	**997**	**1,170**
Dissolved Gases (RSK-175)										
Carbon Dioxide	**330,000**	NA	NA	NA	NA	NA	NA	NA	**160,000**	**270,000**
Ethane	< 0.47 U	NA	NA	NA	NA	NA	NA	NA	< 0.47 U	< 0.47 U
Ethene	< 0.55 U	NA	NA	NA	NA	NA	NA	NA	< 0.55 U	**6.3**
Methane	**750**	NA	NA	NA	NA	NA	NA	NA	**2.0**	**310**
Dechlorinating Bacteria										

LHAAP-58 Remedial Action Operation Validated Data - December 2019

Location ID: Sample Date:	Units	MCL/MSC	03WW01_121819 12/18/19	35ASW03	35AWW01_122019 12/20/19	35AWW06_121919 12/19/19	35AWW08_121819 12/18/19	35AWW09_121819 12/18/19	35AWW10_121919 12/19/19	35AWW10_121919-a 12/19/19	35AWW11_121819 12/18/19	35AWW12_121819 12/18/19	35AWW13_121819 12/18/19	35AWW14_121919 12/19/19	35AWW15_122019 12/20/19	35AWW16_121919 12/19/19	35AWW17_121819 12/18/19	35AWW18_121819 12/18/19	35AWW19_121819 12/18/19	35AWW20_121919 12/19/19
		Location Description	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - ESE, inside site boundary.	Site 58 - ESE, inside site boundary. Duplicate	Site 58 - SE, inside site boundary.	Site 58 - E, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - W, inside site boundary.	Site 58 - SW, outside site boundary, near Building 744-A.	Site 58 - SW, outside site boundary.	Site 58 - SSW, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary.
		Location Depth	Shallow	Surface Water	Intermediate	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
BAV1 Vinyl Chloride Reductase	cells/mL	NV	**0.7**		NA	**29.6**	< 3.1 U	< 2.6 U	NA	NA	< 0.60 U	NA	NA	NA	NA	NA	NA	NA	< 0.50 U	**49100**
Dehalobacter spp.	cells/mL	NV	**2480**		NA	< 10.2 U	**173000**	**42500**	NA	NA	**213000**	NA	NA	NA	NA	NA	NA	NA	**12200**	**6070**
Dehalococoides	cells/mL	NV	**22,200**		NA	**80.3**	**1200000**	**2,400,000**	NA	NA	**900**	NA	NA	NA	NA	NA	NA	NA	**14.8**	**27800**
tceA Reductase	cells/mL	NV	**595**		NA	< 1.0 U	**313000**	**377000**	NA	NA	**6.70**	NA	NA	NA	NA	NA	NA	NA	**0.3 J**	< 0.5 U
Vinyl Chloride Reductase	cells/mL	NV	**6080**		NA	< 1.0 U	**366000**	**330000**	NA	NA	**99.7**	NA	NA	NA	NA	NA	NA	NA	**0.60**	**4.60**
Metals (SW6020)																				
Arsenic	mg/L	0.01	**0.0158**		NA	NA	**0.0253**	**0.000606 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

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

NA - Not Analyzed

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

LHAAP-58 Remedial Action Operation Validated Data - December 2019

Location ID: Sample Date:	Units	MCL/MSC	34AWW21_122019 12/20/19	34AWW21_122019-a 12/20/19	35AWW22_121819 12/18/19	35AWW23_121819 12/18/19	35AWW24_121919 12/19/19	LHSMW04	LHSMW06_122019 12/20/19	LHSMW06_122019_a 12/20/19	LHSMW07_121919 12/19/19
		Location Description	Site 58 - ESE, outside site boundary, beside Building 725.	Site 58 - ESE, outside site boundary, beside Building 725. Duplicate	Site 58 - ENE, outside site boundary.	Site 58 - SW, outside site boundary.	Downgradient Western Plume well		Site 58 - SW, inside site boundary, beside Building 715.	Site 58 - SW, inside site boundary, beside Building 715. Duplicate	Site 58 - SW, outside site boundary.
		Location Depth	Shallow	Shallow	Shallow	Shallow	Shallow		Shallow	Shallow	Shallow
		Frequency					Quarterly				Quarterly
		Lab Package	HS19121257	HS19121257	HS19121092	HS19121092	HS19121155		HS19121257	HS19121257	HS19121155
Total Organic Carbon (415.1/SM5310C)											
Total Organic Carbon	mg/L	NV	NA	NA	NA	**127**	NA		NA	NA	**3.48 J**
Volatile Organic Compounds (8260C)											
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,1-Dichloroethane	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		**8.4**	**8.4**	**13**
1,1-Dichloroethene	µg/L	7	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		**19 J**	**20 J**	**46 J**
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,2-Dichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	**0.64 J**
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,3,5-Trimethylbenzene	µg/L	5100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
2-Butanone	µg/L	61000	< 1.0 UJ	< 1.0 UJ	< 1.0 U	**390**	< 1.0 UJ		< 1.0 UJ	< 1.0 UJ	< 1.0 UJ
2-Chlorotoluene	µg/L	2000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6100	< 1.0 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 UJ		< 1.0 UJ	< 1.0 UJ	< 1.0 UJ
4-Chlorotoluene	µg/L	2000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
4-Methyl-2-pentanone	µg/L	8200	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ		< 1.0 UJ	< 1.0 UJ	< 1.0 UJ
Acetone	µg/L	92000	< 1.0 U	< 1.0 U	< 2.0 U	**480 J**	< 1.0 UJ		< 2.0 UJ	< 2.0 UJ	< 1.0 UJ
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Bromobenzene	µg/L	2000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Bromochloromethane	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	Dry	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Bromomethane	µg/L	140	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Carbon disulfide	µg/L	10000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ		< 1.0 UJ	< 1.0 UJ	< 1.0 UJ
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Chloroethane	µg/L	41000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Chloroform	µg/L	1000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
cis-1,2-Dichloroethene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	**7.6**	< 0.5 UJ		**68 J**	**68 J**	**1.2 J**
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Dichlorodifluoromethane	µg/L	20000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 UJ		< 0.5 UJ	< 0.5 UJ	< 1.0 UJ
Isopropylbenzene	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
m,p-Xylene	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 UJ		< 0.5 UJ	< 0.5 UJ	< 1.0 UJ
Methylene chloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 UJ		< 0.5 UJ	< 0.5 UJ	< 1.0 UJ
n-Butylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
n-Propylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
Naphthalene	µg/L	2000	< 0.5 U	< 0.5 U	< 0.5 U	**1.6**	< 0.5 U		< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
sec-Butylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
tert-Butylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		**1.9 J**	**1.9 J**	< 0.5 UJ
Toluene	µg/L	1000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		**1.4 J**	**1.5 J**	< 0.5 UJ
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Trichloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	**2.7**	< 0.5 UJ		**17 J**	**17 J**	**3.1 J**
Trichlorofluoromethane	µg/L	31000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ		< 0.5 UJ	< 0.5 UJ	< 0.5 UJ
Vinyl chloride		2	< 0.5 U	< 0.5 U	< 0.5 U	**1.1**	< 0.5 UJ		**5.7 J**	**5.6 J**	**42 J**
Volatile Fatty Acids (HPLC-METACIDS)											
Acetic Acid	mg/L	NV	NA	NA	NA	**140**	NA		NA	NA	< 2.0 U
Butyric Acid	mg/L	NV	NA	NA	NA	< 1.0 U	NA		NA	NA	< 1.0 U
Lactic Acid	mg/L	NV	NA	NA	NA	< 1.0 U	NA		NA	NA	< 1.0 U
Propionic Acid	mg/L	51	NA	NA	NA	< 1.0 U	NA		NA	NA	< 1.0 U
Pyruvic Acid	mg/L	NV	NA	NA	NA	< 0.10 U	NA		NA	NA	< 0.10 U
Anions (9056A)											
Chloride	mg/L	NV	NA	NA	NA	**868**	NA		NA	NA	**1,770**
Nitrate	mg/L	10	NA	NA	NA	< 0.500 U	NA		NA	NA	< 0.500 U
Sulfate	mg/L	NV	NA	NA	NA	**1.62 J**	NA		NA	NA	**2,560**
Dissolved Gases (RSK-175)											
Carbon Dioxide	µg/L	NV	NA	NA	NA	**360,000**	NA		NA	NA	**250,000**
Ethane	µg/L	NV	NA	NA	NA	< 0.47 U	NA		NA	NA	< 0.47 U
Ethene	µg/L	NV	NA	NA	NA	< 0.55 U	NA		NA	NA	**2.8**
Methane	µg/L	NV	NA	NA	NA	**1,400**	NA		NA	NA	**100**
Dechlorinating Bacteria											

00954374

LHAAP-58 Remedial Action Operation Validated Data - December 2019

Location ID: Sample Date:	Units	MCL/MSC	34AWW21_122019 12/20/19	34AWW21_122019-a 12/20/19	35AWW22_121819 12/18/19	35AWW23_121819 12/18/19	35AWW24_121919 12/19/19	LHSMW04	LHSMW06_122019 12/20/19	LHSMW06_122019_a 12/20/19	LHSMW07_121919 12/19/19
		Location Description	Site 58 - ESE, outside site boundary, beside Building 725.	Site 58 - ESE, outside site boundary, beside Building 725. Duplicate	Site 58 - ENE, outside site boundary.	Site 58 - SW, outside site boundary.	Downgradient Western Plume well		Site 58 - SW, inside site boundary, beside Building 715.	Site 58 - SW, inside site boundary, beside Building 715. Duplicate	Site 58 - SW, outside site boundary.
		Location Depth	Shallow	Shallow	Shallow	Shallow	Shallow		Shallow	Shallow	Shallow
BAV1 Vinyl Chloride Reductase	cells/mL	NV	NA	NA	NA	**0.40 J**	NA		NA	NA	**3.30**
Dehalobacter spp.	cells/mL	NV	NA	NA	NA	< 5.6 U	NA		NA	NA	**5230**
Dehalococoides	cells/mL	NV	NA	NA	NA	**689**	NA		NA	NA	**949.0**
tceA Reductase	cells/mL	NV	NA	NA	NA	**29.6**	NA		NA	NA	**0.20 J**
Vinyl Chloride Reductase	cells/mL	NV	NA	NA	NA	**69.8**	NA		NA	NA	**271**
Metals (SW6020)											
Arsenic	mg/L	0.01	NA	NA	NA	NA	NA		< 0.000500 U	< 0.000500 U	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

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

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to disc

UJ - The analyte was not detected; however, the result is estimated due to discrepancies

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

NV - No Value

LHAAP-12 Year 12 Annual RA-O Sampling
December 2019

		Location Code	12WW10R		12WW20		12WW21				12WW22		12WW24	
		Sample ID	12WW10R-191203		12WW20-191203		12WW21-191203		12WW21-191203-FD		12WW22-191203		12WW24-191203	
		Sample Date	12/3/2019		12/3/2019		12/3/2019		12/3/2019		12/3/2019		12/3/2019	
		Location Description	Shallow Zone, Unimpacted, Outside Site Boundary		Shallow Zone, Unimpacted, Outside Site Boundary		Shallow Zone, Unimpacted, Outside Site Boundary				Shallow Zone, Unimpacted, Outside Site Boundary		Shallow Zone, Impacted, Outside Site Boundary	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Volatile Organic Compounds by EPA Method 8260														
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	UJ	12	
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	UJ	19	
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	UJ	< 0.5	U

Notes:

Blue highlighting Indicates concentrations above the MCL

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

MCL - Maximum Contaminant Limit

ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1
November 2019

		Location Code	35BWW01		35BWW04				35BWW05		35BWW07		35BWW08		35BWW09	
		Sample ID	35BWW01-191121		35BWW04-191121		35BWW04-191121-FD		35BWW05-191125		35BWW07-191125		35BWW08-191121		35BWW09-191126	
		Sample Date	11/21/2019		11/21/2019		11/21/2019		11/25/2019		11/25/2019		11/21/2019		11/26/2019	
		Location Description	Shallow zone, unimpacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, unimpacted downgradient		Shallow zone, unimpacted, within site boundary		Shallow zone, impacted outside site boundary	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Volatile Organic Compounds by EPA Method 8260																
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	8.3		7.7		1.4		< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	0.93	J	0.93	J	6		< 0.5	U	< 0.5	U	47	
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Notes:

Blue Highlighting Indicates concentrations above the MCL/PCL

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

MCL - Maximum Contaminant Limit

ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1
November 2019

		Location Code	35BWW10		35BWW11		35BWW12		35BWW13		35BWW14		35BWW15			
		Sample ID	35BWW10-191126		35BWW11-191121		35BWW12-191125		35BWW13-191125		35BWW14-191125		35BWW15-191122		35BWW15-191122-FD	
		Sample Date	11/26/2019		11/21/2019		11/25/2019		11/25/2019		11/25/2019		11/22/2019		11/22/2019	
		Location Description	Shallow, impacted, within site boundary		Shallow zone, unimpacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, unimpacted, crossgradient		Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Volatile Organic Compounds by EPA Method 8260																
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	4.6		1.2		1.1	
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	1.5		< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	0.84	J	< 0.5	U	5.8		< 0.5	U	38		11		11	
Trichloroethene	µg/L	5	0.9	J	< 0.5	U	0.55	J	< 0.5	U	16		7.8		7.6	
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Notes:

Blue Highlighting Indicates concentrations above the MCL/PCL
J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U - Undetected: The analyte was analyzed for, but not detected.
MCL - Maximum Contaminant Limit
ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1
November 2019

		Location Code	35BWW16		35BWW17		35BWW18		35BWW19		35BWW20		35BWW23		35BWW24	
		Sample ID	35BWW16-191121		35BWW17-191121		35BWW18-191126		35BWW19-191126		35BMW20-191122		35BWW23-191125		35BWW24-191125	
		Sample Date	11/21/2019		11/21/2019		11/26/2019		11/26/2019		11/22/2019		11/25/2019		11/25/2019	
		Location Description	Shallow zone, impacted, outside site boundary		Shallow zone, impacted, within site boundary		Shallow zone, unimpacted, outside site boundary		Shallow zone, unimpacted, outside site boundary		Shallow sone, impacted, within site boundary		Shallow zone, unimpacted, outside site boundary		Shallow zone, unimpacted, outside site boundary	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Volatile Organic Compounds by EPA Method 8260																
1,1-Dichloroethene	µg/L	7	0.75	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	8.1		< 0.5	U	< 0.5	U	< 0.5	U	15		< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	3.2		< 0.5	U	< 0.5	U	< 0.5	U	3.1		< 0.5	U	1.8	
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Notes:

Blue Highlighting Indicates concentrations above the MCL/PCL
J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U - Undetected: The analyte was analyzed for, but not detected.
MCL - Maximum Contaminant Limit
ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1
November 2019

		Location Code	35BWW25				35BWW26		LHSMW58	
		Sample ID	35BWW25-191122		35BWW25-191122-FD		35BWW26-191121		LHSMW58-191122	
		Sample Date	11/22/2019		11/22/2019		11/21/2019		11/22/2019	
		Location Description	Shallow zone, impacted, outside site boundary		Shallow zone, impacted, outside site boundary		Shallow zone, unimpacted, within site boundary		Shallow zone, impacted, within site boundary	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Volatile Organic Compounds by EPA Method 8260										
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	4.2	
Trichloroethene	µg/L	5	13		13		< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Notes:

Blue Highlighting Indicates concentrations above the MCL/PCL
J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U - Undetected: The analyte was analyzed for, but not detected.
MCL - Maximum Contaminant Limit
ug/L - micrograms per liter

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

March 3, 2020

DAIN-ODB-LO

Mr. William Rhotenberry
U.S. Environmental Protection Agency
1201 Elm Street, Suite 500
Dallas, TX 75270-2002

Re: Final Fifth Annual Remedial Action Operation Report, LHAAP-67, Aboveground Storage Tank Farm, Longhorn Army Ammunition Plant, Karnack, Texas, March 2020

Dear Mr. Rhotenberry,

One set of replacement pages and one compact disc (CD) of the above-referenced document are being transmitted to you for your records. There were no regulatory comments on the draft document, so the replacement pages consist of a replacement cover and text pages with the report version revised to “Final”.

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, 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.

Sincerely,

Rose M. Zeiler

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

Copies furnished:
A. Palmie, TCEQ, Austin, TX (letter)
P. Bruckwicki, Caddo Lake NWR, TX (1 set replacement pages and 1 CD)
R. Smith USACE, Tulsa District, OK (1 set replacement pages and 1 CD)
A. Williams, USACE, Tulsa District, OK (1 CD)
A. Maly USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 set replacement pages and 1 CD)
P. Srivastav, APTIM, Houston, TX (letter)

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

March 3, 2020

DAIN-ODB-LO

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

Re: Final Fifth Annual Remedial Action Operation Report, LHAAP-67, Aboveground Storage Tank Farm, Longhorn Army Ammunition Plant, Karnack, Texas, March 2020

Dear Ms. Palmie,

One set of replacement pages and one compact disc (CD) of the above-referenced document are being transmitted to you for your records. There were no regulatory comments on the draft document, so the replacement pages consist of a replacement cover and text pages with the report version revised to "Final".

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, 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.

Sincerely,

Rose M. Zeiler

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

Copies furnished:
W. Rhotenberry, USEPA Region 6, Dallas, TX (letter)
P. Bruckwicki, Caddo Lake NWR, TX (1 set replacement pages and 1 CD)
R. Smith, USACE, Tulsa District, OK (1 set replacement pages and 1 CD)
A. Williams, USACE, Tulsa District, OK (1 CD)
A. Maly, USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 set replacement pages and 1 CD)
P. Srivastav, APTIM, Houston, TX (letter)

00954382

Final

Fifth Annual Remedial Action Operation Report, LHAAP-67 (Aboveground Storage Tank Farm)

Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for

U.S. Army Corps of Engineers, Tulsa District
Contracting Division
2488 East 81st Street
Tulsa, Oklahoma 74137-4290

Prepared by

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Prepared by

APTIM

Aptim Federal Services, LLC
2500 City West, Suite 1700
Houston, Texas 77042

Contract No. W9128F-13-D-0012
Task Order No. W9128BV17F0150
Project No. 501032
Rev 0
March 2020

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Acronyms and Abbreviations

µg/L	micrograms per liter
DCA	dichloroethane
DCE	dichloroethene
AECOM	AECOM Technical Services, Inc.
APTIM	Aptim Federal Services, LLC
AST	aboveground storage tank
bgs	below ground surface
Bhate	Bhate Environmental, Inc.
COCs	contaminants of concern
DHC	*Dehalococcoides Sp.*
DO	dissolved oxygen
J	estimated value
LHAAP	Longhorn Army Ammunition Plant
LUCs	land use controls
MATOC	Multiple Award Task Order Contract
MCL	maximum contaminant level
MEGA	Multiple Environmental Government Acquisition
mg/L	milligrams per liter
MMRP	Military Munitions Response Program
MNA	monitored natural attenuation
mV	millivolts
No.	number
ORP	oxidation-reduction potential
RACR	Remedial Action Completion Report
RA-O	remedial action operation
RAWP	Remedial Action Work Plan
ROD	Record of Decision
RD	Remedial Design
Shaw	Shaw Environmental & Infrastructure, Inc.
SU	standard unit
TCA	trichloroethane
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality

Acronyms and Abbreviations *(continued)*

TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Tulsa District, contracted with Bhate Environmental, Inc. (Bhate) under the Omaha Multiple Environmental Government Acquisition (MEGA) National Small Business Multiple Award Task Order Contract (MATOC), Environmental Remediation Services with Military Munitions Response Program (MMRP), Task Order Number (No.) W9128BV17F0150, to conduct environmental restoration at multiple sites at the former Longhorn Army Ammunition Plant (LHAAP). The Bhate Team is comprised of Bhate and Aptim Federal Services, LLC (APTIM).

A Final Record of Decision (ROD) was executed for LHAAP-67 in June 2010 (USACE 2010). Groundwater monitoring at LHAAP-67 is ongoing as described in the Draft Final Remedial Action Completion Report (RACR) (AECOM 2015). This remedial action operation (RA[O]) report represents the fifth year of RA-O implementation and summarizes the results of site inspections and sampling activities completed between August 2018 and August 2019. The draft first year RA-O report was prepared in March 2015. The fourth year RA-O report, which covered the period between November 2017 and July 2018, was prepared in January 2019. This report encompasses and provides analysis for five years of monitored natural attenuation (MNA) data.

LHAAP is located in east Texas in the northeastern corner of Harrison County between State Highway 43 in Karnack, Texas, and the western shore of Caddo Lake (see **Figure 1-1**). The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the east. Caddo Lake is a large freshwater lake that bounds LHAAP to the north and east. The eastern fence of the LHAAP installation is 3.5 miles from the Texas-Louisiana state border.

1.1 Remedial Action Objectives

The remedial action objectives at the LHAAP-67 site must protect human health and meet applicable or relevant and appropriate requirements. There are no ecological risks at the LHAAP-67 site (USACE 2010).

The remedial action objectives for the LHAAP-67 site, consistent with the reasonably anticipated future use as a national wildlife refuge, are:

- 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 into nearby surface water

- Return of groundwater to its potential beneficial use as drinking water, wherever practicable

1.2 Performance Objectives

The remedy selected for LHAAP-67 is land use control (LUC) and MNA. The performance objectives at LHAAP-67 consist of two components: 1) physical inspections and 2) groundwater/surface water monitoring. As a component of the LUC implementation, the civil survey of the LUC boundary was conducted in November 2014 and recorded in the Harrison County Courthouse in December 2014. Physical inspections are conducted periodically to confirm compliance with the LUC objectives, which consist of preventing human exposure to groundwater contamination presenting an unacceptable risk to a future maintenance worker and ensuring that there is no withdrawal or use of groundwater from the site for anything other than environmental monitoring and testing until the cleanup levels are attained. Groundwater monitoring has been in-progress at the site since May 2013, and LHAAP-67 was included as part of the site wide Final Fourth Five Year Review Report finalized in May 2019 (USACE 2019).

According to the Remedial Design (RD), groundwater monitoring is being performed to demonstrate that natural attenuation is an effective remedy that will attain the remediation objectives over time and that the groundwater plume will not migrate to nearby surface water bodies at levels that may present an unacceptable risk to human health and the environment (Shaw 2011). Groundwater monitoring is being performed in accordance with the Remedial Action Work Plan (RAWP) (AECOM 2013) to:

- Detect changes in environmental conditions that may reduce the efficacy of natural attenuation processes
- Identify potentially toxic and/or mobile transformation products
- Verify that the plume is not expanding and poses no unacceptable risk to downgradient receptors
- Detect new releases of contaminants to the environment that could impact effectiveness of the natural attenuation remedy
- Verify attainment of the remediation objectives

Work completed as part of the 2018/2019 RA-O consisted of the following:

- October 2018 groundwater monitoring event consisting of 15 wells
- May 2019 groundwater monitoring event consisting of 15 wells

- LUC inspection
- July-August 2019 Monitoring Well Installation
- Well Maintenance Activities

This report summarizes the LUC compliance inspection, results of groundwater sampling, and an evaluation of MNA.

1.3 Site Description

LHAAP-67 is in the central portion of LHAAP, as shown on **Figure 1-2**, and covers an area of approximately 1.9 acres. The site topography is relatively flat. The nearest significant surface water body is Central Creek located approximately 870 feet southeast of LHAAP-67. Central Creek eventually flows into Caddo Lake.

When operational, LHAAP-67 consisted of seven aboveground storage tanks (ASTs) used for storing No. 2 fuel oil, kerosene, and solvents. The size of the tanks is unknown. The tanks were surrounded by earthen dikes designed to contain potential spills. The ASTs have been removed and the only structure remaining at the site is a railroad bed.

The LUC area associated with the groundwater use restriction at LHAAP-67 extends beyond the historical site boundaries along the western, eastern, and southern sections of the site, and encompasses a total of 2.6 acres. LHAAP-67 has no known areas of archaeological or historical importance.

1.4 Conceptual Site Model

A detailed Conceptual Site Model of LHAAP-67 was previously presented in the ROD (USACE 2010). Based upon additional data collected as part of final remedy implementation as presented in the LHAAP-67 Final RACR (AECOM 2016), the lithologic units at the site have been reclassified.

Historically, two distinct water-bearing zones (shallow and intermediate) had been designated at LHAAP-67; however, during drilling performed for the 2013 investigation, no continuous clay layer (i.e., aquitard) or significant lithological differences between previously identified shallow and intermediate zones were encountered. Co-located monitoring wells 67WW06 (total depth 47.55 feet below ground surface [bgs]) and 67WW07 (total depth 24.0 feet bgs), historically identified as intermediate and shallow zone wells, respectively, had similar static groundwater levels during the four sampling events performed during 2013/2014, with a maximum difference of 1.04 feet noted during the January 2014 event (these small differences were confirmed in the four 2014/2015 sampling events with a maximum difference of 0.08 feet. Therefore, the previously designated shallow and intermediate zones are now considered to be hydraulically connected and constitute a single uppermost groundwater-bearing unit at LHAAP-67 to a depth of approximately 50 feet bgs. Monitoring well 67WW06, which was previously identified as an intermediate zone well, has been re-classified as a shallow zone monitoring well, screened in the uppermost groundwater-bearing unit. A deeper “intermediate” water-bearing zone was identified at a depth of approximately 68 feet bgs in boring 67DPT14 (drilled in June 2014) with a clear aquitard separating this unit from the shallow zone. To assess the deeper “intermediate” water-bearing zone, 67WW16I was installed in May 2016. Based on this information, shallow and intermediate water-bearing zones are present in the LHAAP-67 investigation area, but the configuration has been modified from that presented in the RD as discussed above.

The contaminants of concern (COCs) identified in the ROD for LHAAP-67 shallow zone groundwater are trichloroethene (TCE), 1,1-dichloroethene (DCE), 1,2-dichloroethane (DCA), 1,1,1-trichloroethane (TCA), and 1,1,2-TCA. It is also noted that vinyl chloride, a degradation product of TCE, was detected again during the fifth year RA-O period at 67WW01 in May 2019, however it was below the maximum contaminant level (MCL) of 2 micrograms per liter (µg/L). The presence of these COCs in the shallow groundwater zone represents the primary driver for remedial action as they are at concentrations above the human health standard for a hypothetical future maintenance worker under an industrial exposure scenario. No COCs were detected in 67WW16I in May 2016, November 2017, May 2018, October 2018, or May 2019 confirming the June 2014 results from temporary well 67DPT14 and indicating that COCs are confined to the shallow groundwater zone.

The nature and extent of groundwater contamination at LHAAP-67 was evaluated during field investigations conducted between 1998 and 2007. It is believed that historic releases from the ASTs at the site contaminated the soil, with contaminants then leaching from the soil into groundwater. A relatively small area of contamination is observed in the shallow groundwater which poses an unacceptable carcinogenic risk and non-carcinogenic hazard to a hypothetical future maintenance worker under an industrial exposure scenario. There is no groundwater contamination in the deeper “intermediate” groundwater zone. The only potentially complete exposure pathway is via use of shallow groundwater zone as drinking water. However, shallow groundwater is not used as drinking water at the refuge and the pathway is eliminated from any hypothetical receptor because LUCs are in place that prohibits the use of groundwater other than for environmental monitoring and testing. The nearest significant surface water body to LHAAP-67 site is Central Creek, located upgradient and approximately 870 feet from the site as shown on **Figure 1-2**. There is no other surface water body in close proximity to the LHAAP-67 site. Therefore, there is not a complete pathway from groundwater to surface water.

The 1st Annual RA-O report indicated that the dominant shallow zone groundwater gradient appeared to be to the north/northeast, but the flow direction began to shift direction by May 2014 towards the north/northwest and continued to show a north/northwesterly flow direction. Based on groundwater level data collected 2015 through 2019, the dominant shallow zone groundwater gradient appears to be to the north/northwest. The apparent change of the shallow zone groundwater gradient may be due to the increase in precipitation the area received during the current monitoring period (i.e., 2015/2016) (particularly in 2015) and the resulting rise in groundwater levels. The historical gradient was originally assumed to be to the southeast in the Final RD (Shaw 2011) and was based on data collected primarily from three monitoring wells because some of the wells such as 67WW03 and 67WW04 were dry most of the time. Therefore, because the groundwater is flowing away from Central Creek at LHAAP-67, the potential discharge to surface water in Central Creek became an incomplete exposure pathway and surface water sampling as stated in the RAWP and RACR was deemed no longer necessary (AECOM 2013 and 2016).

To assess the deeper "intermediate" water-bearing zone, monitoring well 67WW16I was completed to a depth of 78 feet bgs. This well was sampled in May 2016, November 2017, May 2018, October 2018, and May 2019 and no COCs were detected. This sampling confirms that COCs are confined to the shallow zone groundwater.

In response to the *Fourth Five-Year Review Report* (USACE 2019) recommendation to "evaluate data in the north area of the plume to determine if temporary exceedances indicate plume migration or require extension of the plume boundary monitoring well system", two new monitoring wells (67WW17 and 67WW18) were installed in the shallow groundwater zone in July and August 2019. The well installations are discussed further in **Section 2.5**.

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2.0 SITE ACTIVITIES AT LHAAP-67

This section describes the results of the Year 5 RA-O activities including annual LUC compliance inspection, semiannual groundwater monitoring, monitoring well installation, and monitoring system repairs and/or maintenance performed at LHAAP-67.

2.1 Annual LUC Compliance Inspection

The annual LUC compliance inspection for LHAAP-67 was performed on 14 Aug 2019. The LUC for this site is groundwater restriction, which prohibits water well installation for any purpose other than environmental monitoring and testing; and residential groundwater use until the levels of COCs in groundwater and soil allow unrestricted use and unlimited exposure. The restriction applies to groundwater underlying an approximately 6-acre area defined by the surveyed LUC boundary (AECOM 2016). The Annual LUC Compliance Certification Documentation Form for the Year 5 RA-O monitoring period is included in **Appendix A**. No non-compliance issues or concerns were noted during the annual inspection.

2.2 Groundwater Monitoring

The Year 5 RA-O monitoring is the third of three years of semiannual monitoring. Two groundwater sampling events were completed in October 2018 and May 2019 and are reported here. Sample Collection Logs are included in **Appendix C**. Sampling was attempted at 15 monitoring wells during each of the sampling events (October 2018 and May 2019) as shown on **Table 2-1**. Monitoring well locations are depicted in **Figure 2-1**.

Prior to collecting groundwater samples, monitoring wells were gauged using a water level probe, and the depth-to-water was recorded to the nearest 0.01 feet from the top of casing. Depth-to-water measurements were used to calculate the groundwater elevations presented in **Table 2-2**. Monitoring wells 67WW01 and 67WW03 were gauged for water level in October 2018, however there was insufficient water to collect groundwater samples. In May 2019 monitoring well 67WW03 was dry and could not be gauged or sampled.

Water samples were collected using low-flow sampling techniques as described in the groundwater sampling procedures found in the *Final Installation-Wide Work Plan* (Bhate 2018).

2.2.1 Approved Modifications to the Groundwater Monitoring Program

Minor modifications have been made to the groundwater monitoring program, in coordination with U.S. Environmental Protection Agency (USEPA) and the Texas Commission on Environmental Quality (TCEQ), since it was first developed in the RAWP (AECOM 2013).

- Monitoring wells 67WW09A and 67WW10 replaced the sampling of 67WW04 to bound the plume to the south.
- 67WW04 will continue to be gauged for water levels only during each sampling event.
- Monitoring wells 67WW06 and 67WW07 are now considered duplicative and only 67WW07 will be sampled in the future.
- 67WW06 will continue to be gauged for water levels only during each sampling event.
- Monitoring wells 67WW01 and 67WW08 were selected in the RAWP for collection of MNA geochemical parameters. Based on the presence of groundwater and an evaluation of COC concentrations and monitoring well locations with respect to the plume, it was determined in coordination with USEPA and TCEQ that future sampling for MNA geochemical parameters will occur at monitoring well 67WW13 in addition to 67WW08.
- No further surface water monitoring is planned for the LHAAP-67 site at Central Creek (AECOM 2016).

2.2.2 Groundwater Elevations and Flow Direction

During the Year 5 RA-O sampling events, water levels were gauged in October 2018 and May 2019 and used to determine groundwater flow direction, as shown on **Figures 2-2** and **2-3**. In May 2019 monitoring wells 67WW03 and 67WW04 were dry, however this did not limit the ability to construct a potentiometric surface contour map. Based on the gauging data during this event, the groundwater flow direction is interpreted to be north/northwesterly.

The groundwater elevations across the site during the Years 2, 3, 4, and 5 RA-O sampling events remained similar with the predominant groundwater flow direction in a north/north-westerly direction.

2.2.3 Groundwater Monitoring and Analytical Results

Semi-annual groundwater samples were collected and analyzed for volatile organic compounds (VOCs) according to SW-846 Method 8260. During the October 2018 sampling event, there was insufficient water to collect a sample for analysis at monitoring wells 67WW01 and 67WW03. In May 2019, 67WW03 was dry and a sample was not collected for analysis. Samples were also collected from 67WW08 and 67WW13 and analyzed for MNA geochemical parameters (**Table 2-1**).

During the fifth semi-annual RA-O sampling events, monitoring wells 67WW01, 67WW02, 67WW08, 67WW13, and 67WW15, contained VOCs above their respective MCLs in one or both sampling events. The highest concentrations of VOCs were detected in wells 67WW01 and 67WW15, which are cross-gradient to each other. Analytical results for the fifth semi-annual RA-O period are presented in **Table 2-3** and **Table 2-4**. **Table 2-3** presents the VOC and MNA data from the two semiannual events from RA-O Year 5, while **Table 2-4** presents the data from the first through the fifth annual events. Historical COC results are presented in **Table 2-5**. **Figures 2-4** and **2-5** depict the VOC data in wells sampled in October 2018 and May 2019, respectively. The trends of COC concentrations in monitoring wells with COC concentrations greater than the MCL are depicted in graphs presented on **Figure 2-6**. An expanded discussion on the VOCs and their distribution including trend analysis is included **Section 3.1**.

Groundwater monitoring well sampling forms for the October 2018 and May 2019 sampling events were completed for each monitoring well sampled and are included in **Appendix C**. Laboratory analytical results are included in **Appendix D**.

2.3 Surface Water Sampling

Surface water monitoring is not required for LHAAP-67, based on the change in the groundwater flow direction, and with TCEQ and USEPA concurrence. The current north/northeast groundwater flow direction indicates that Central Creek, located south of the LHAAP-67 site, is upgradient from the site and surface water monitoring continues to be unnecessary.

2.4 Groundwater Monitoring System Maintenance

Inspections of the conditions/integrity of monitoring wells are conducted during each sampling event and the information is recorded on the field sampling forms. **Appendix B** includes a photo log, which shows the condition of the wells in October 2018 and May 2019. Maintenance or repairs are performed as needed, based on observed conditions. During the Year 5 reporting period, no damage to well bollards, pads, or protective well casings was observed. Also, only minimal encroachment of weeds or brush on the well pads was observed. Mowing the area to control brush and weeds is conducted on a routine basis as needed to allow access to the wells, and was conducted at LHAAP-67 on 29 Apr 2019. **Table 2-6** provides a summary of the maintenance activities that were performed at the site during the Year 5 RA-O period.

2.5 Groundwater Monitoring Optimization

In accordance with the recommendation in the Fourth Five Year Review Report (USACE 2019), two monitoring wells (67WW17 and 67WW18) were installed to the north and northwest of the site to evaluate the extent of the plume boundary in those directions. The wells were installed as 4-inch-diameter PVC wells with 10-foot screens using a hollow-stem auger drilling rig. The screened intervals were selected based on the conditions observed during drilling and to match the depth of the interval screened in the nearby wells where recent analytical exceedances had been observed. Monitoring well 16WW17 was installed at 27 feet below ground surface (bgs) with a screened interval from 17 to 27 feet to match the shallow screened interval in well 67WW02, while well 16WW18 was installed at 39 feet bgs with a screened interval from 29 to 39 feet bgs to match the screened interval in well 67WW15. Boring logs for the newly installed wells are included in **Appendix C**. The wells were developed in accordance with the Final Installation-Wide Work Plan (IWWP) (Bhate 2018) and will be sampled during the next RA-O sampling event in October 2019. The analytical results from those samples will be used to determine if there is a need to adjust the RA-O monitoring network. No additional changes are recommended to the groundwater-monitoring program for the Year 5 RA-O sampling event. The monitoring well network for Year 6 RA-O sampling is presented in Table 2-7. In accordance with the RAWP (AECOM 2013), since the 3-year semiannual LTM period has been completed, monitoring will be conducted annually beginning in October 2019 until the next Five Year Review.

3.0 NATURAL ATTENUATION EVALUATION

The following sections present the results of the natural attenuation evaluation in accordance with the three lines of evidence discussed in the Final RD (Shaw 2011) for site COCs.

3.1 First Line of Evidence: Change in COC Concentrations

Natural attenuation is the combination of multiple mechanisms, including biodegradation, volatilization, dilution, advection, and absorption that reduce contaminant concentrations. The decrease of COC concentrations over time and distance is evidence of natural attenuation. The change in groundwater COC concentrations over time and with distance was evaluated at LHAAP-67. COC concentrations for the October 2018 and May 2019 sampling events are provided on **Figures 2-4** and **2-5** as well as **Tables 2-3** and **2-4**. COCs exceeding their respective MCLs are highlighted. To aid in evaluating COCs over time, concentration trends are provided on **Figure 2-6**.

Based on the general direction of groundwater flow, monitoring wells 67WW04, 67WW09A, and 67WW10 are considered upgradient background monitoring wells and monitoring wells 67WW12, 67WW02, and 67WW05 can be considered downgradient monitoring wells. In-plume monitoring wells include 67WW01, 67WW08, 67WW09, 67WW11, 67WW13, 67WW15, and 67WW16. Monitoring wells 67WW07 and 67WW14 are considered cross-gradient wells. In the Year 5 RA-O event, five monitoring wells had COC concentrations above the MCL: 67WW01, 67WW02, 67WW08, 67WW13, and 67WW15. During the Year 5 RA-O period, the COCs at 67WW11 have remained below the MCL since the Year 4 RA-O period in November 2017.

After the Year 5 RA-O sampling events, the newer well 67WW15 now has enough data points in the trend to run the Mann-Kendall analysis, along with the four previously evaluated wells. The following discusses the observations and trends for the monitoring wells with COC concentrations above the MCL.

Mann-Kendall analysis for the Year 5 RA-O monitoring period was completed for 1,1-DCE, 1,2-DCA, and 1,1,2-TCA. The results are presented in **Appendix E** in graphical format with statistical results presented on the bottom of the page. The GSI Mann-Kendall Tool Kit was used for this analysis. The concentrations of COCs are presented in µg/L. Half the reporting limit was used for non-detect values. For locations with field duplicate samples, the primary sample concentration was used in the trend analysis. The level of significance is calculated for each analysis and is provided on the trend analysis sheet. A summary table of the Mann-Kendall results is provided on **Table 3-1**. Historical COC results for all wells are present in **Table 2-5**.

Significant Decreases

Mann-Kendall analysis identified statistically significant evidence of decreasing trends at the following:

- **Monitoring well 67WW08—1,2-DCA.** Concentrations of 1,2-DCA have fluctuated since 2013 and decreased to 5.1 µg/L in May 2019. These decreasing trends may be the result of natural attenuation (e.g., dilution from clean upgradient groundwater). The 1,1-DCE concentrations are not significantly decreasing but were probably decreasing as they have decreased from 940 µg/L in 2013 to 110 µg/L in May 2019. Results from future sampling events will continue to be evaluated for COC concentration trends.

Concentrations of 1,1-DCE in samples from well 67WW11 have remained below the MCL during Year 4 and Year 5 RA-O sampling events; therefore, Mann-Kendall analysis was not conducted for this well.

Significant Increases

Mann-Kendall analysis identified statistically significant evidence of increasing trends at the following wells:

- **Monitoring well 67WW01—1,1-DCE and 1,2-DCA.** Historically, 1,1,1-TCA and 1,1,2-TCA were detected above the MCL at this well along with their degradation daughter products 1,1-DCE and 1,2-DCA. The initial increase in 1,1-DCE and 1,2-DCA indicates that degradation is occurring as expected. Since 2016, 1,1,1-TCA and 1,1,2-TCA have been reduced to or near non-detect levels, and 1,1-DCE and 1,2-DCA have been decreasing. Although the Mann-Kendall analysis indicates increasing trends, the concentrations have been decreasing since the highest levels were observed in 2016.

- **Monitoring well 67WW02—1,1-DCE.** During the fifth year RA-O period, 1,1-DCE concentration increased from 6.9 µg/L in October 2018 to 180 µg/L in May 2019. This is a slight decrease from 190 µg/L concentration detected in May 2018. Since February 2015, concentrations have increased from below the MCL to levels above and have fluctuated, in an increasing trend (**Figure 2-6**). The concentration detected in October 2018 is the highest concentration of 1,1-DCE detected at this monitoring well to date. Results from future sampling events will continue to be evaluated for COC concentration trends.

- **Monitoring well 67WW13—1,2-DCA.** Over the five-year RA-O period, 1,2-DCA concentrations at 67WW13 have remained stable with 23.1 µg/L in May 2013 and 24 µg/L in May 2019. 1,1-DCE continues to be stable at this well with no statistical trend and only an 84.8% confidence.

Stable/No Trend

Mann-Kendall analysis identified a trend as either stable or no trend at the following:

- **Monitoring well 67WW15—1,1-DCE, 1,2-DCA, and 1,1,2-TCA.** Concentrations of 1,1-DCE have decreased since 2016 from 2,460 µg/L to 330 µg/L in May 2019. However, the COC concentrations have fluctuated between 510 µg/L and 330 µg/L between 2017 and May 2019 and statistically there is no trend. Concentrations of 1,2-DCA and 1,1,2-TCA have also decreased since the first sampling event in 2016, however the overall trends show that the data is stable. The Mann-Kendall analysis indicates that the groundwater contaminant plume in the vicinity of monitoring well 67WW15 continues to be stable.

- **Monitoring well 67WW13—1,1-DCE.** Over the five-year RA-O period, changes in 1,1-DCE concentrations show no statistical trend, indicating that the groundwater contaminant plume in the vicinity of 67WW13 is stable.

At monitoring well 67WW14, 1,1-DCE, and 1,2-DCA were above the detection limits only during the 3rd year RA-O sampling events, suggesting that the plume may be expanding to the west. However, these constituents have been below their respective MCLs during the Year 4 and Year 5 RA-O sampling events and are not increasing over time.

3.1.1 Predictive Modeling

During the Year 3 RA-O sampling event, statistically significant decreases were observed at 67WW09 and 67WW11, using Mann-Kendall analysis for 1,1-DCE and 1,2-DCA. All COCs at these two wells were below the MCL during the Year 5 RA-O sampling, indicating the MNA processes are reducing concentrations at LHAAP-67.

As previously noted in **Section 3.1**, the Mann-Kendall analysis was used to determine that a statistically significant decrease in concentration over time was observed at monitoring well 67WW08 for 1,2-DCA. To determine the estimated time to achieve the MCL, a time-dependent attenuation rate was determined and is provided in **Appendix F**. The first order rate constant was estimated at 0.001 day^{-1} and the time to achieve the MCL of 5 µg/L, from 5.1 µg/L observed in May 2019, is estimated to be 0.1 years. A significant decrease in COCs is not occurring in other wells and therefore degradation rates cannot be calculated to determine a time to achieve the MCL for the plume (i.e., predictive modeling by assuming some degree of degradation and degradation half-lives is not meaningful for this plume).

3.1.2 Plume Stability

Plume maps for the two Year 5 RA-O sampling events are presented in **Figures 2-4** and **2-5**. 1,1, 2-TCA, 1,1-DCE and 1,2-DCA are the most widespread COCs in the shallow groundwater. The COC data from the RA-O monitoring indicate that the plume is migrating north/northwest, in the direction of groundwater flow.

Even though the overall plume is relatively stable, the Mann-Kendall indicates a significant increasing trend for 1,1-DCE at downgradient monitoring well 67WW02 since the beginning of the RA-O period. The highest 1,1-DCE concentration at 67WW02 was detected in May 2019 at 180 µg/L. At this well, a pattern of annual fluctuations has been observed since 2017 where the COCs are below the MCLs in the fall and then rebound to levels above the MCL in the spring. However, there does not seem to be a correlation between COC concentrations and groundwater elevations. These data may suggest plume migration towards monitoring well 67WW02 from in-plume monitoring wells 67WW01, 67WW08, and 67WW15. Monitoring well 67WW05, downgradient of monitoring well 67WW15, continues to be non-detect for the site COCs, and therefore, defines the northwest downgradient extent of COCs of the site plumes. At monitoring well 67WW12 located on the east side in the downgradient direction, COCs have not been detected above the MCL.

In-plume monitoring well 67WW15 indicates COC trends are stable indicating that the plume is not migrating to the west and abiotic natural attenuation processes, including dilution from upgradient clean groundwater, may be decreasing COC levels.

Monitoring well 67WW13, located downgradient from monitoring well 67WW15, exhibited a stable trend for 1,1-DCE and an increasing trend for 1,2-DCA. Similar to monitoring well 67WW15, monitoring well 67WW13 remains bounded by downgradient monitoring well 67WW05 where COCs have not been detected above MCLs.

At cross-gradient monitoring well 67WW14, located in the southwestern quadrant, COCs were observed above their respective MCLs once during the Year 3 RA-O. Concentrations have been below the MCL during the Year 4 and Year 5 RA-O sampling events, indicating that the plume is not expanding to the southwest. Cross-gradient monitoring well 67WW07 also has concentrations below the MCLs over the five year RA-O period.

Based on the general direction of groundwater flow, the COCs in upgradient monitoring wells 67WW04, 67WW09A and 67WW10 have remained below the MCLs.

As detailed above, concentration data from monitoring well 67WW02 may suggest that the plume is migrating in the direction of groundwater flow. Based on recommendations of the 2019 Five Year Review, two additional wells (67WW17 and 67WW18) were installed in July-August 2019 to determine if contaminants are migrating to the north and northwest as shown on **Figure 3-1**.

3.2 Second Line of Evidence: Geochemical Indicators

Tables 2-3 and **2-4** include the geochemical indicators that are useful MNA evaluation parameters. Some geochemical indicators are collected in the field and are recorded for all sampling events for all wells. In February 2019 the *Final Technical Memorandum – Monitored Natural Attenuation Monitoring Parameters* (Bhate 2019) updated the list of geochemical parameters to reduce redundancy. The updated list of parameters collected at LHAAP-67 is reflected in **Tables 2-3** and **2-4**. The full list of parameters analyzed for the MNA evaluation were collected at two wells 67WW08 and 67WW013. The field parameters for LHAAP-67 wells include dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, conductivity, turbidity, ferrous iron, and temperature.

Dissolved Oxygen

DO is the most thermodynamically favored electron acceptor used by microbes for biodegradation of organic carbon, whether natural or anthropogenic (USEPA 1998). Anaerobic bacteria, which are the primary microbes able to degrade the site COCs, generally cannot function at DO concentrations greater than about 0.5 milligrams per liter (mg/L) and hence, reductive dechlorination may not occur.

Monitoring wells 67WW01, 67WW02, 67WW08, 67WW13, and 67WW15 were evaluated because COC concentrations are greater than the MCL. The DO concentrations ranged from 0.08 mg/L to 2.85 mg/L during the Year 5 RA-O sampling events, with 6 of the 9 readings below the 0.5 mg/L threshold. The DO levels of 0.50 mg/L or less observed in these impacted wells are favorable for reductive dechlorination.

Oxidation Reduction Potential

The ORP levels indicate the oxidative or reductive potential in the aquifer matrix and provide real-time data to determine if conditions are conducive for anaerobic biodegradation. ORP values less than 50 millivolts (mV) indicate that anaerobic conditions are present in the aquifer and are favorable for biological reductive dechlorination of chlorinated ethenes and ethanes.

During the Year 5 RA-O monitoring period, the ORP measurements have generally been positive in all wells. Specifically, in monitoring wells 67WW08, 67WW13, and 67WW15, ORP values have been greater than 50 mV ranging from 73 mV to 281 mV. These measurements indicate oxidative conditions which are not favorable for reductive dechlorination.

Nitrate

After DO has been depleted by microbes in the treatment zone, nitrate may be used as an electron acceptor for the degradation of organic carbon via denitrification and is reduced to nitrite. Nitrate levels above 1.0 mg/L may compete with reductive dechlorination (USEPA 1998). Nitrate was analyzed at monitoring wells 67WW08 and 67WW13 in October 2018 and May 2019. Nitrite was analyzed only during the October 2018 sampling event, and then was removed per the Technical Memorandum (Bhate 2019). The nitrate concentrations were below 1 mg/L and will not compete as a respiratory substrate with site COCs.

Iron Reduction

After nitrate, iron (III) (ferric iron) is used as an electron acceptor during anaerobic biodegradation of organic carbon. During this process, iron (III) is reduced to iron (II) (ferrous iron), which is soluble in water. Therefore, an increase in ferrous iron can indicate reducing groundwater conditions. During the Year 4 RA-O sampling, ferrous iron was detected at low levels and ranged from 0.04 to 0.063 mg/L. During the Year 5 RA-O sampling, ferrous iron ranged from below the detection limit to 0.343 mg/L. An increase in ferrous iron was not observed and does not indicate that reducing conditions are present in the groundwater.

Sulfate

After DO, nitrate, and iron have been depleted in the groundwater, sulfate is used as an electron acceptor and is reduced to sulfide. Concentrations of sulfate greater than 20 mg/L may compete with reductive dechlorination of the site COCs. However, in many plumes with high concentrations of sulfate, reductive dechlorination still occurs (USEPA 1998). Sulfate was sampled at monitoring wells 67WW08 and 67WW13 during the Year 5 RA-O and ranged from 284 mg/L to 499 mg/L. Relatively high concentrations of sulfate and corresponding low sulfide concentrations in October 2018 indicate that sulfate-reducing conditions do not exist, and the aquifer is not conducive for sulfate reduction.

Methane

Methanogenesis occurs in highly reducing conditions and generally occurs after oxygen, nitrate, iron, and sulfate have been depleted. Methane levels above 500 µg/L are considered indicative of methanogenic conditions (USEPA 1998). Methane concentrations were less than 5.5 µg/L during the Year 5 RA-O at 67WW08 and 67WW13 and suggest that methanogenic conditions are not present in the groundwater.

Total Organic Carbon

Regardless of the electron acceptor being used, organic carbon is a required source of reduced carbon and energy to sustain microbial activity. Total organic carbon (TOC) is utilized as an energy and hydrogen source to support the reductive dechlorination of the chlorinated COCs. TOC concentrations greater than 20 mg/L are considered adequate to support microbial activity (USEPA 1998).

TOC was analyzed in monitoring wells 67WW08 and 67WW13 during the Year 5 RA-O sampling events and ranged from 2.09 mg/L to 3.99 mg/L. This data indicates that carbon concentrations in the groundwater are not supportive of reductive dechlorination.

pH

The pH of the groundwater has an effect on the activity of microbial populations. Microbes capable of degrading chlorinated aliphatic hydrocarbons generally prefer pH values from 6 to 8 standard units (SU) (USEPA 1998). The shallow zone groundwater pH within the plume during the Year 5 RA-O period ranged from 5.43 SU (67WW15) to 6.5 SU (67WW01), with an average of value of 5.87 SU. The pH levels in these wells are marginal for dechlorinating bacteria.

Ethene and Ethane

Ethane and ethene are the end products of the reductive dechlorination pathways for chlorinated ethanes and ethenes. During the Year 5 RA-O, 67WW08 and 67WW13 were analyzed for ethene and ethane, and concentrations continue to be below the laboratory reporting limits (<0.48 µg/L). This data indicates that complete dechlorination is not occurring at this time.

Geochemical Indicator MNA Parameter Summary

The qualitative assessment of geochemical indicators during the five-year RA-O period in the shallow groundwater zone at LHAAP-67 indicates current geochemical conditions are not favorable for MNA processes via biological reduction. Nonetheless, certain parameters observed in a few locations may indicate that conditions could favor biological natural attenuation, such as the low DO concentrations observed. The presence of degradation products, 1,2-DCA and 1,1-DCE, suggest that limited biological degradation is occurring; however, the primary MNA processes reducing concentrations are abiotic.

3.3 Third Line of Evidence: Microbial Analysis

If the first two lines of evidence for MNA are deemed inadequate or inconclusive, and/or if the need for a contingency remedy is evaluated, data from field or microcosm studies will be necessary to establish the third line of evidence for MNA.

Dechlorinating bacteria, *Dehalococcoides sp.* (DHC), were analyzed at 67WW08 and 67WW13 in October 2018 during the Year 5 RA-O sampling event. The DHC levels in both wells were significantly lower than 1.0×10^7, which is associated with concentrations that may be required to expect treatment (Xiaoxia 2006). DHC analysis was not conducted in May 2019 based on the recommendation in the 2019 Five Year Review (U.S. Army 2019) and will not be conducted in the future.

4.0 SUMMARY AND CONCLUSIONS

4.1 Summary

The LUC for LHAAP-67 is groundwater restriction, which prohibits water well installation for any purpose other than environmental monitoring and testing; and residential groundwater use within the LUC boundary until the levels of COCs in groundwater and soil allow unrestricted use and unlimited exposure. The annual LUC compliance inspection for the Year 5 RA-O period was conducted on 14 Aug 2019. No change in land use or groundwater use has occurred at the site during the entire five years of RA-O monitoring. Overall, the plume is stable; however, COC concentration above cleanup goals at the downgradient well 67WW02 has warranted the installation of two monitoring wells, 67WWW17 and 67WW18, as shown in **Figure 3-1**.

No non-compliance issues or concerns were identified during the annual inspection and site monitoring wells were in good condition.

VOC data and geochemical indicators were collected over the course of the monitoring period at LHAAP-67 to evaluate effectiveness of MNA as a site remedy. A tiered approach was used to evaluate the occurrence of natural attenuation in site groundwater. The first line of evidence evaluated reductions in COC concentrations and assessed the time to achieve the MCL. The second line of evidence evaluated geochemical indicators, and the third line of evidence evaluated microbial populations in the aquifer. The results of the tiered evaluation and the conclusions are summarized below.

An assessment of the first line of evidence included an evaluation of the groundwater flow and COC degradation trends. Based on RA-O groundwater level measurements, the groundwater flow direction at LHAAP-67 continues to be north/northwest and towards monitoring well 67WW02. The 3rd RA-O assessment suggested that a possible shift in the plume to the west due to increasing COC concentrations toward 67WW14, however COCs were not observed above MCLs during the Year 4 and Year 5 RA-O sampling events and did not support this shift.

In-plume well 67WW15 (recently installed in May 2016) exhibited the highest levels of COCs during the Year 5 RA-O monitoring period for the third year in a row. 67WW01, cross-gradient well to 67WW15, also has some of the highest concentrations.

The only significantly decreasing trend was observed for 1,2-DCA, in the downgradient, south eastern monitoring well 67WW08. The first order rate constant for 1,2-DCA was estimated at 0.001 day^{-1} and the time to achieve the MCL of 5 µg/L is estimated at 0.1 years. The decreasing trend may be the result of natural attenuation (e.g., dilution from clean upgradient groundwater).

Monitoring well 67WW01 was dry in October 2018, but an overall decrease was observed for both 1,1-DCE and 1,2-DCA between May 2018 and May 2019. At well 67WW02, even though there was an increase in 1,1-DCE concentration between October 2018 and May 2019, an overall decrease was observed between May 2018 and May 2019. At this well, a slight increase in 1,2-DCA concentration was observed from nondetect in October 2018 to 4.7 µg/L in May 2019. At 67WW13, significant increases were observed in 1,1-DCE and 1,2-DCA concentrations between May 2018 and October 2018, but concentration decreased again in May 2019. Both wells are located downgradient of monitoring well 67WW08, where concentrations are decreasing, and the increases may be due to the migration of these COCs in groundwater. Additionally, increases in 1,1-DCE and 1,2-DCA may be due to the degradation of 1,1,1-TCA and 1,1,2-TCA observed at LHAAP-67 since 1998.

At 67WW02 COC concentrations have increased above the MCL, and two downgradient monitoring wells outside the MCL boundary have been installed in July/August 2019 to aid in bounding the plume and assessing plume migration as recommended in the Fourth Five Year Review Report.

The qualitative assessment of geochemical indicators performed as the second line of evidence at LHAAP-67 indicates current geochemical conditions are not optimal for biological degradation MNA processes. Although, degradation products (1,2-DCA and 1,1-DCE) have been detected in monitoring wells, groundwater conditions within the impacted area are not favorable for complete biological reductive dechlorination of site COCs.

The third line of evidence to assess MNA is to evaluate microorganisms that demonstrate biological degradation. During the Year 5 RA-O, DHC was not observed at levels favorable for reductive dechlorination. DHC analysis was not conducted in May 2019 based on the recommendation in the 2019 Five Year Review (U.S. Army 2019) and will not be conducted in the future.

The evaluation of MNA at LHAAP-67 indicates that decreasing concentrations are primarily due to abiotic processes, including dispersion, dilution, sorption, and volatilization. After completion of the 5-year RA-O monitoring period, groundwater monitoring on an annual basis will continue to be performed at LHAAP-67 until the next Five Year Review, in compliance with the RAWP (AECOM 2013). Two new wells, 67WW17 and 67WW18, will be added to the next RA-O sampling event.

5.0 REFERENCES

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Tables

Table 2-1
Groundwater RA-O Sampling – 2018 and 2019

Monitoring Well ID	October 2018				May 2019			
	VOCs	Field Parameters [a]	MNA Parameters [b]	Water Levels	VOCs	Field Parameters [a]	MNA Parameters [b]	Water Levels
67WW01	Not a sufficient amount of water to sample			X	X	X		X
67WW02	X	X		X	X	X		X
67WW03	Not a sufficient amount of water to sample			X	Not a sufficient amount of water to sample			Dry
67WW04 [c]	Gauge for water levels only			X	Gauge for water levels only			Dry
67WW05	X	X		X	X	X		X
67WW06 [d]	Gauge for water levels only			X	Gauge for water levels only			X
67WW07	X	X		X	X	X		X
67WW08	X	X	X	X	X	X	X	X
67WW09	X	X		X	X	X		X
67WW09A	X	X		X	X	X		X
67WW10	X	X		X	X	X		X
67WW11	X	X		X	X	X		X
67WW12	X	X		X	X	X		X
67WW13	X	X	X	X	X	X	X	X
67WW14	X	X		X	X	X		X
67WW15	X	X		X	X	X		X
67WW16I	X	X		X	X	X		X

Notes:

[a] Field parameters to be monitored for all wells: pH, temperature, conductivity, turbidity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and ferrous iron.

[b] MNA parameters include alkalinity, sulfate, sulfide, chloride, TOC, dissolved iron and manganese, total phosphorus, carbon dioxide, dissolved gases (methane, ethane, ethene) and total iron.

[c] 67WW04 was replaced by 67WW09A and 67WW10

[d] 67WW06 was eliminated in May 2018 due to the close proximity of 67WW07

ID - identification

MNA - monitored natural attenuation

RA-O - remedial action operation

TOC - total organic carbon

VOCs - volatile organic compounds

X - well will be analyzed for that parameter

Table 2-2
Groundwater Elevation Data, LHAAP-67

Well ID	Sampling Date	Top of Casing Elevation	Ground Surface Elevation (ft MSL)	Depth to Water (ft from TOC)	Screen Interval (ft from TOC)		Screen Interval (ft MSL)		Groundwater Elevation (ft MSL)
					Top	Bottom	Top	Bottom	
67WW01 [c,d]	05/31/13	200.92	198.21	25.55	17.25	26.98	183.67	173.94	175.37
	09/27/13	200.92	198.21	Dry	17.25	26.98	183.67	173.94	Dry
	01/23/14	200.92	198.21	Dry	17.25	26.98	183.67	173.94	Dry
	05/07/14	200.92	198.21	26.9	17.25	26.98	183.67	173.94	174.02
	07/24/14	200.92	198.21	26.20	17.25	26.98	183.67	173.94	174.72
	12/02/14	200.92	198.21	25.17	17.25	26.98	183.67	173.94	175.75
	02/10/15	200.92	198.21	25.55	17.25	26.98	183.67	173.94	175.37
	05/19/15	200.92	198.21	23.40	17.25	26.98	183.64	173.91	177.52
	11/18/15	200.92	198.21	26.17	17.25	26.98	183.64	173.91	174.75
	03/28/16	200.92	198.21	23.71	17.25	26.98	183.64	173.91	177.21
	05/18/16	200.92	198.21	23.26	17.25	26.98	183.64	173.91	177.66
	11/28/17	200.92	198.21	25.95	17.25	26.98	183.64	173.91	174.97
	05/02/18	200.92	198.21	24	17.25	26.98	183.64	173.91	176.92
	10/25/18	200.92	198.21	26.98	17.25	26.98	183.64	173.91	173.94
	05/03/19	200.92	198.21	22.97	17.25	26.98	183.64	173.91	177.95
67WW02 [c,d]	05/31/13	199.69	196.61	24.38	18.05	27.78	181.64	171.91	175.31
	09/27/13	199.69	196.61	25.28	18.05	27.78	181.64	171.91	174.41
	01/23/14	199.69	196.61	24.77	18.05	27.78	181.64	171.91	174.92
	05/06/14	199.69	196.61	27.68	18.05	27.78	181.64	171.91	172.01
	07/23/14	199.69	196.61	23.45	18.05	27.78	181.64	171.91	176.24
	12/02/14	199.69	196.61	24.13	18.05	27.78	181.64	171.91	175.56
	02/10/15	199.69	196.61	23.65	18.05	27.78	181.64	171.91	176.04
	05/11/15	199.69	196.61	22.79	18.05	27.78	181.97	172.24	176.90
	11/18/15	199.69	196.61	24.22	18.05	27.78	181.97	172.24	175.47
	05/18/16	199.69	196.61	22.58	18.05	27.78	181.97	172.24	177.11
	11/28/17	199.69	196.61	23.95	18.05	27.78	181.97	172.24	175.74
	05/03/18	199.69	196.61	24.15	18.05	27.78	181.97	172.24	175.54
	10/25/18	199.69	196.61	24.35	18.05	27.78	181.97	172.24	175.34
	05/01/19	199.69	196.61	22.42	18.05	27.78	181.97	172.24	177.27
67WW03 [c]	05/31/13	200.44	198.12	25.39	15.27	24.9	185.17	175.54	175.05
	09/27/13	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	01/23/14	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	05/06/14	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	07/23/14	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	12/02/14	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	02/10/15	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	05/11/15	200.44	198.12	22.98	15.27	24.9	185.17	175.54	177.46
	11/18/15	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	03/28/16	200.44	198.12	23.2	15.27	24.9	185.17	175.54	177.24
	05/18/16	200.44	198.12	22.76	15.27	24.9	185.17	175.54	177.68
	11/27/17	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	05/02/18	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry
	10/22/18	200.44	198.12	24.95	15.27	24.9	185.17	175.54	175.49
	05/02/19	200.44	198.12	Dry	15.27	24.9	185.17	175.54	Dry

Table 2-2
Groundwater Elevation Data, LHAAP-67

Well ID	Sampling Date	Top of Casing Elevation	Ground Surface Elevation (ft MSL)	Depth to Water (ft from TOC)	Screen Interval (ft from TOC)		Screen Interval (ft MSL)		Groundwater Elevation (ft MSL)
					Top	Bottom	Top	Bottom	
67WW04 [a]	09/27/13	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	01/23/14	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	05/06/14	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	07/25/14	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	12/02/14	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	02/10/15	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	05/11/15	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	11/18/15	203.76	200.5	Dry	3.26	3.26	200.5	200.5	Dry
	05/16/16	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	11/27/17	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	05/02/18	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
	10/25/18	203.76	200.5	24.48	14.26	24.26	189.5	179.5	179.28
	05/02/19	203.76	200.5	Dry	14.26	24.26	189.5	179.5	Dry
67WW05 [a]	09/28/13	201	197.48	26.40	19.52	29.52	181.48	171.48	174.60
	01/23/14	201	197.48	26.00	19.52	29.52	181.48	171.48	175.00
	05/06/14	201	197.48	25.85	19.52	29.52	181.48	171.48	175.15
	07/23/14	201	197.48	25.20	19.52	29.52	181.48	171.48	175.80
	12/02/14	201	197.48	25.55	19.52	29.52	181.48	171.48	175.45
	02/10/15	201	197.48	26.20	19.52	29.52	181.48	171.48	174.80
	05/11/15	201	197.48	24.68	19.52	29.52	181.48	171.48	176.32
	11/18/15	201	197.48	25.76	3.52	3.52	197.48	197.48	175.24
	05/18/16	201	197.48	24.56	19.52	29.52	181.48	171.48	176.44
	11/28/17	201	197.48	25.6	19.52	29.52	181.48	171.48	175.40
	05/02/18	201	197.48	25.8	19.52	29.52	181.48	171.48	175.20
	10/25/18	201	197.48	25.8	19.52	29.52	181.48	171.48	175.20
	05/02/19	201	197.48	24.46	19.52	29.52	181.48	171.48	176.54
67WW06 [a]	05/31/13	200.81	196.95	25.32	41.86	51.86	158.95	148.95	175.49
	09/28/13	200.81	196.95	26.32	41.86	51.86	158.95	148.95	174.49
	01/24/14	200.81	196.95	26.61	41.86	51.86	158.95	148.95	174.20
	05/06/14	200.81	196.95	23.75	41.86	51.86	158.95	148.95	177.06
	07/23/14	200.81	196.95	23.75	41.86	51.86	158.95	148.95	177.06
	12/02/14	200.81	196.95	24.80	41.86	51.86	158.95	148.95	176.01
	02/10/15	200.81	196.95	23.95	41.86	51.86	158.95	148.95	176.86
	05/11/15	200.81	196.95	22.38	41.86	51.86	158.95	148.95	178.43
	11/18/15	200.81	196.95	24.80	41.86	51.86	158.95	148.95	176.01
	05/18/16	200.81	196.95	22.16	41.86	51.86	158.95	148.95	178.65
	11/29/17	200.81	196.95	24.66	41.86	51.86	158.95	148.95	176.15
	05/02/18	200.81	196.95	23.18	41.86	51.86	158.95	148.95	177.63
	10/25/18	200.81	196.95	24.91	41.86	51.86	158.95	148.95	175.90
	05/03/19	200.81	196.95	21.63	41.86	51.86	158.95	148.95	179.18
67WW07 [a]	05/31/13	200.84	197.04	25.35	17.8	27.8	183.04	173.04	175.49
	09/27/13	200.84	197.04	26.32	17.8	27.8	183.04	173.04	174.52
	01/23/14	200.84	197.04	25.6	17.8	27.8	183.04	173.04	175.24
	05/06/14	200.84	197.04	23.8	17.8	27.8	183.04	173.04	177.04
	07/24/14	200.84	197.04	23.83	17.8	27.8	183.04	173.04	177.01
	12/02/14	200.84	197.04	24.75	17.8	27.8	183.04	173.04	176.09
	02/10/15	200.84	197.04	24.00	17.8	27.8	183.04	173.04	176.84

Table 2-2
Groundwater Elevation Data, LHAAP-67

Well ID	Sampling Date	Top of Casing Elevation	Ground Surface Elevation (ft MSL)	Depth to Water (ft from TOC)	Screen Interval (ft from TOC)		Screen Interval (ft MSL)		Groundwater Elevation (ft MSL)
					Top	Bottom	Top	Bottom	
67WW07 [a]	05/11/15	200.84	197.04	22.45	17.8	27.8	183.04	173.04	178.39
	11/18/15	200.84	197.04	24.84	3.8	3.8	197.04	197.04	176.00
	05/18/16	200.84	197.04	22.21	17.8	27.8	183.04	173.04	178.63
	11/29/17	200.84	197.04	24.65	17.8	27.8	183.04	173.04	176.19
	05/02/18	200.84	197.04	24.25	17.8	27.8	183.04	173.04	176.59
	10/25/18	200.84	197.04	24.94	17.8	27.8	183.04	173.04	175.90
	05/03/19	200.84	197.04	21.72	17.8	27.8	183.04	173.04	179.12
67WW08 [b,d]	06/03/13	200.02	197.60	24.65	26.02	50.52	174	149.5	175.37
	10/02/13	200.02	197.60	25.57	26.02	50.52	174	149.5	174.45
	01/23/14	200.02	197.60	24.9	26.02	50.52	174	149.5	175.12
	05/07/14	200.02	197.60	23.65	26.02	50.52	174	149.5	176.37
	07/24/14	200.02	197.60	23.41	26.02	50.52	174	149.5	176.61
	12/04/14	200.02	197.60	24.23	26.02	50.52	174	149.5	175.79
	02/11/15	200.02	197.60	23.46	26.02	50.52	174	149.5	176.56
	05/19/15	200.02	197.60	22.25	26.02	50.52	174	149.5	177.77
	11/19/15	200.02	197.60	24.38	2.42	2.42	197.6	197.6	175.64
	05/19/16	200.02	197.60	22.12	26.04	50.54	174	149.5	177.90
	11/28/17	200.02	197.60	24	26.04	50.54	174	149.5	176.02
	05/01/18	200.02	197.60	22.92	26.04	50.54	174	149.5	177.10
	10/23/18	200.02	197.60	24.41	26.04	50.54	174	149.5	175.61
	05/01/19	200.02	197.60	21.67	26.04	50.54	174	149.5	178.35
67WW09 [b]	06/01/13	198.21	195.72	22.78	16.99	36.49	181.22	161.72	175.43
	09/28/13	198.21	195.72	23.66	16.99	36.49	181.22	161.72	174.55
	01/24/14	198.21	195.72	22.95	16.99	36.49	181.22	161.72	175.26
	05/06/14	198.21	195.72	21.52	16.99	36.49	181.22	161.72	176.69
	07/25/14	198.21	195.72	21.40	16.99	36.49	181.22	161.72	176.81
	12/04/14	198.21	195.72	22.25	16.99	36.49	181.22	161.72	175.96
	02/11/15	198.21	195.72	21.50	16.99	36.49	181.22	161.72	176.71
	05/19/15	198.21	195.72	20.30	16.99	36.49	181.22	161.72	177.91
	11/18/15	198.21	195.72	22.24	2.49	2.49	195.72	195.72	175.97
	05/18/16	198.21	195.72	20.15	16.99	36.49	181.22	161.72	178.06
	11/27/17	198.21	195.72	22.06	16.99	36.49	181.22	161.72	176.15
	05/02/18	198.21	195.72	20.95	16.99	36.49	181.22	161.72	177.26
	10/23/18	198.21	195.72	22.43	16.99	36.49	181.22	161.72	175.78
	05/03/19	198.21	195.72	19.83	16.99	36.49	181.22	161.72	178.38
67WW09A [b]	09/27/13	202.93	200.4	28.4	23.33	38.03	179.6	164.9	174.53
	01/23/14	202.93	200.4	27.65	23.33	38.03	179.6	164.9	175.28
	05/06/14	202.93	200.4	26.1	23.33	38.03	179.6	164.9	176.83
	07/24/14	202.93	200.4	26.06	23.33	38.03	179.6	164.9	176.87
	12/03/14	202.93	200.4	27.00	23.33	38.03	179.6	164.9	175.93
	02/10/15	202.93	200.4	26.11	23.33	38.03	179.6	164.9	176.82
	05/12/15	202.93	200.4	24.97	23.33	38.03	179.6	164.9	177.96
	11/18/15	202.93	200.4	26.97	2.53	2.53	200.4	200.4	175.96
	05/18/16	202.93	200.4	24.61	23.33	38.03	179.6	164.9	178.32
	11/29/17	202.93	200.4	26.81	23.33	38.03	179.6	164.9	176.12
	05/03/18	202.93	200.4	25.78	23.33	38.03	179.6	164.9	177.15
	10/25/18	202.93	200.4	27.02	23.33	38.03	179.6	164.9	175.91
	05/02/19	202.93	200.4	24.35	23.33	38.03	179.6	164.9	178.58

Table 2-2
Groundwater Elevation Data, LHAAP-67

Well ID	Sampling Date	Top of Casing Elevation	Ground Surface Elevation (ft MSL)	Depth to Water (ft from TOC)	Screen Interval (ft from TOC)		Screen Interval (ft MSL)		Groundwater Elevation (ft MSL)
					Top	Bottom	Top	Bottom	
67WW10 [b]	06/01/13	201.51	198.8	26.1	22.71	52.21	178.8	149.3	175.41
	09/27/13	201.51	198.8	27.03	22.71	52.21	178.8	149.3	174.48
	01/24/14	201.51	198.8	26.22	22.71	52.21	178.8	149.3	175.29
	05/06/14	201.51	198.8	24.4	22.71	52.21	178.8	149.3	177.11
	07/24/14	201.51	198.8	24.42	22.71	52.21	178.8	149.3	177.09
	12/03/14	201.51	198.8	25.58	22.71	52.21	178.8	149.3	175.93
	02/10/15	201.51	198.8	24.55	22.71	52.21	178.8	149.3	176.96
	05/12/15	201.51	198.8	23.10	22.71	52.21	178.8	149.3	178.41
	11/18/15	201.51	198.8	25.49	2.71	2.71	198.8	198.8	176.02
	05/18/16	201.51	198.8	22.73	22.71	52.21	178.8	149.3	178.78
	11/29/17	201.51	198.8	25.35	22.71	52.21	178.8	149.3	176.16
	05/03/18	201.51	198.8	23.77	22.71	52.21	178.8	149.3	177.74
	10/22/18	201.51	198.8	25.65	22.71	52.21	178.8	149.3	175.86
	05/02/19	201.51	198.8	22.31	22.71	52.21	178.8	149.3	179.20
67WW11 [b]	06/01/13	199.64	197.21	24.21	22.93	47.43	176.71	152.21	175.43
	10/02/13	199.64	197.21	25.17	22.93	47.43	176.71	152.21	174.47
	01/23/14	199.64	197.21	24.45	22.93	47.43	176.71	152.21	175.19
	05/06/14	199.64	197.21	22.86	22.93	47.43	176.71	152.21	176.78
	07/24/14	199.64	197.21	23.89	22.93	47.43	176.71	152.21	175.75
	12/04/14	199.64	197.21	23.77	22.93	47.43	176.71	152.21	175.87
	02/11/15	199.64	197.21	23.95	22.93	47.43	176.71	152.21	175.69
	05/19/15	199.64	197.21	21.67	22.93	47.43	176.71	152.21	177.97
	11/19/15	199.64	197.21	23.91	2.43	2.43	197.21	197.21	175.73
	05/19/16	199.64	197.21	22.48	22.93	47.43	176.71	152.21	177.16
	11/27/17	199.64	197.21	23.53	22.93	47.43	176.71	152.21	176.11
	05/02/18	199.64	197.21	22.37	22.93	47.43	176.71	152.21	177.27
	10/23/18	199.64	197.21	23.95	22.93	47.43	176.71	152.21	175.69
	05/01/19	199.64	197.21	21.21	22.93	47.43	176.71	152.21	178.43
67WW12 [b]	06/01/13	201.65	199.07	26.46	26.58	36.08	175.07	165.57	175.19
	10/01/13	201.65	199.07	24.4	26.58	36.08	175.07	165.57	177.25
	01/24/14	201.65	199.07	26.8	26.58	36.08	175.07	165.57	174.85
	05/06/14	201.65	199.07	25.43	26.58	36.08	175.07	165.57	176.22
	07/25/14	201.65	199.07	25.30	26.58	36.08	175.07	165.57	176.35
	12/03/14	201.65	199.07	26.12	26.58	36.08	175.07	165.57	175.53
	02/10/15	201.65	199.07	25.35	26.58	36.08	175.07	165.57	176.30
	05/12/15	201.65	199.07	24.50	26.58	36.08	175.07	165.57	177.15
	11/18/15	201.65	199.07	26.16	2.58	2.58	199.07	199.07	175.49
	05/18/16	201.65	199.07	24.16	26.58	36.08	175.07	165.57	177.49
	11/29/17	201.65	199.07	26.03	26.58	36.08	175.07	165.57	175.62
	05/03/18	201.65	199.07	24.85	26.58	36.08	175.07	165.57	176.80
	10/22/18	201.65	199.07	26.30	26.58	36.08	175.07	165.57	175.35
	05/02/19	201.65	199.07	23.85	26.58	36.08	175.07	165.57	177.80
67WW13	05/31/13	197.92	195.85	22.55	12.57	27.07	185.35	170.85	175.37
	10/01/13	197.92	195.85	23.42	12.57	27.07	185.35	170.85	174.50
	01/24/14	197.92	195.85	22.68	12.57	27.07	185.35	170.85	175.24
	05/06/14	197.92	195.85	21.66	12.57	27.07	185.35	170.85	176.26
	07/25/14	197.92	195.85	21.55	12.57	27.07	185.35	170.85	176.37
	12/04/14	197.92	195.85	22.22	12.57	27.07	185.35	170.85	175.70

Table 2-2
Groundwater Elevation Data, LHAAP-67

Well ID	Sampling Date	Top of Casing Elevation	Ground Surface Elevation (ft MSL)	Depth to Water (ft from TOC)	Screen Interval (ft from TOC)		Screen Interval (ft MSL)		Groundwater Elevation (ft MSL)
					Top	Bottom	Top	Bottom	
67WW13	02/11/15	197.92	195.85	21.61	12.57	27.07	185.35	170.85	176.31
	05/19/15	197.92	195.85	20.55	12.57	27.07	185.35	170.85	177.37
	11/18/15	197.92	195.85	22.22	2.07	2.07	195.85	195.85	175.70
	05/19/16	197.92	195.85	20.40	12.57	27.07	185.35	170.85	177.52
	11/28/17	197.92	195.85	21.98	12.57	27.07	185.35	170.85	175.94
	05/01/18	197.92	195.85	21.1	12.57	27.07	185.35	170.85	176.82
	10/23/18	197.92	195.85	22.38	12.57	27.07	185.35	170.85	175.54
	05/01/19	197.92	195.85	20.18	12.57	27.07	185.35	170.85	177.74
67WW14	10/01/13	196.96	194.52	21.8	14.44	29.44	182.52	167.52	175.16
	01/24/14	196.96	194.52	21.47	14.44	29.44	182.52	167.52	175.49
	05/07/14	196.96	194.52	20.58	14.44	29.44	182.52	167.52	176.38
	07/25/14	196.96	194.52	20.25	14.44	29.44	182.52	167.52	176.71
	12/03/14	196.96	194.52	20.85	14.44	29.44	182.52	167.52	176.11
	02/10/15	196.96	194.52	20.40	14.44	29.44	182.52	167.52	176.56
	05/12/15	196.96	194.52	19.64	14.44	29.44	182.52	167.52	177.32
	11/18/15	196.96	194.52	20.81	2.44	2.44	194.52	194.52	176.15
	05/18/16	196.96	194.52	19.4	14.44	29.44	182.52	167.52	177.56
	11/27/17	196.96	194.52	20.51	14.44	29.44	182.52	167.52	176.45
	05/02/18	196.96	194.52	19.9	14.44	29.44	182.52	167.52	177.06
	10/22/18	196.96	194.52	20.85	14.44	29.44	182.52	167.52	176.11
	05/02/19	196.96	194.52	18.78	14.44	29.44	182.52	167.52	178.18
67WW15	05/19/16	199.82	197.24	22.18	34.20	43.90	165.62	155.92	177.64
	11/27/17	199.82	197.24	23.85	34.20	43.90	165.62	155.92	175.97
	05/02/18	199.82	197.24	23	34.20	43.90	165.62	155.92	176.82
	10/23/18	199.82	197.24	24.23	34.20	43.90	165.62	155.92	175.59
	05/03/19	199.82	197.24	22.04	34.20	43.90	165.62	155.92	177.78
67WW16I [e]	05/18/16	199.51	197.12	21.95	67.70	77.40	131.81	122.11	177.56
	11/29/17	199.51	197.12	24.81	67.70	77.40	131.81	122.11	174.70
	05/03/18	199.51	197.12	22.75	67.70	77.40	131.81	122.11	176.76
	10/25/18	199.51	197.12	24.03	67.70	77.40	131.81	122.11	175.48
	05/01/19	199.51	197.12	21.8	67.70	77.40	131.81	122.11	177.71

Notes:

Elevations are reported as feet above mean sea level (ft MSL).

[a] Screen information calculated from Data Gap Investigation Report (Shaw 2007).

[b] Screen information calculated from well construction detail forms.

[c] Well screen top and bottom depths and elevations for monitoring wells 67WW01, 67WW02, and 67WW03 were revised/confirmed with a downhole camera survey performed in March 2015.

[d] Monitoring wells 67WW01, 67WW02, and 67WW08 were re-surveyed in September 2016 and elevations in the table for these wells are based on the re-survey results.

[e] Intermediate zone monitoring well

Dry - insufficient or no water in well

ft - feet

ID - identification

MSL - mean sea level

TOC - top of casing

Table 2-3
Groundwater Results 2018-2019

		Location Code	67WW01	67WW01		67WW02				67WW03		67WW05						67WW07				67WW08					
		Sample ID		67WW01-190503		67WW02-181025		67WW02-190501				67WW05-181025		67WW05-181025-		67WW05-190502		67WW07-181025		67WW07-190503		67WW08-181023		67WW08-181023-		67WW08-190501	
		Sample Date	10/25/2019	5/3/2019		10/25/2018		5/1/2019		10/22/2019	5/2/2019	10/25/2018		10/25/2018		5/2/2019		10/25/2018		5/3/2019		10/23/2018		10/23/2018		5/1/2019	
		Depth		22.97 - 23.23		24.35 - 24.6		22.42 - 22.67				25.8 - 26.07		25.8 - 26.07		24.46 - 24.68		24.94 - 25.19		21.72 - 21.95		24.41 - 24.62		24.41 - 24.62		21.67 - 21.9	
		Sample Purpose		REG		REG		REG				REG		FD		REG		REG		REG		REG		FD		REG	
Parameter	Units	MCL / GW-Ind		Result	Val Qual	Result	Val Qual	Result	Val Qual			Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS			Dry							Dry	Dry																
Chloride	mg/L																					1,820		1,770		1680	
Nitrate	mg/L	10																				< 0.06	U	< 0.06	U	0.5	U
Nitrogen, Nitrite (As N)	mg/L																					< 0.06	U	< 0.06	U		
Sulfate	mg/L																					499		489		479	
Sulfide	mg/L																					< 1	U	< 1	U		
DHC																											
Dehalococcoides	CEQ/mL																					9.3					
FIELD TESTS																											
Conductivity	µS/cm			3.67		4.0		4.03				2.75				2.65		3.80		3.70		6.29				6.28	
Dissolved oxygen	mg/L			0.46		1.27		0.27				0.11				1.99		0.1		0.07		0.08				0.08	
Oxidation-reduction potential	mV			202		129		73				172				247		200		249		150				138	
pH	SU			6.17		6.50		5.74				5.17				4.11		5.01		5.05		6.33				5.82	
Temperature	C			19.81		19.04		24				17.93				20.1		17.79		20.26		18.14				20.44	
Turbidity	NTU			100		1.1		0				21.3				55.2		65.6		31.4		0				0	
GASES																											
Carbon dioxide	µg/L																					130,000		130,000		270,000	
Ethane	µg/L																					< 0.32	U	< 0.32	U	< 0.16	U
Ethylene	µg/L																					< 0.48	U	< 0.48	U	< 0.24	U
Methane	µg/L																					5.4		5.5		2.5	
GEN CHEMISTRY																											
Alkalinity	mg/L																					220		221			
Total inorganic carbon	mg/L																					55		58			
Total organic carbon	mg/L																					2.86		3.19		2.09	
METALS																											
Ferrous Iron	mg/L																					0.343		0.27		0.21	
VOLATILES																											
1,1,1,2-Tetrachloroethane	µg/L	110		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,1,1-Trichloroethane	µg/L	200		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
1,1,2,2-Tetrachloroethane	µg/L	14		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5		1.4		< 0.3	U	1.2				< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,1-Dichloroethane	µg/L	10,000		12		< 0.2	U	8.4				< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	12		12		7.5	
1,1-Dichloroethene	µg/L	7		280		6.9		180				< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	160		160		110	
1,1-Dichloropropene	µg/L	2.9		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichlorobenzene	µg/L	310		< 0.4	U	< 0.4	UJ	< 0.4	U			< 0.4	UJ	< 0.4	U	< 0.4	U	< 0.4	UJ	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,2,3-Trichloropropane	µg/L	0.041		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2-Dibromo-3-chloropropane	µg/L	0.2		< 0.2	U	< 1	U	< 0.2	U			< 1	U	< 1	U	< 0.2	U	< 1	U	< 0.2	U	< 1	U	< 1	U	< 0.2	U
1,2-Dibromoethane	µg/L	0.05		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
1,2-Dichlorobenzene	µg/L	600		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5		21		< 0.2	U	4.7				< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	6.5		6.2		5.1	
1,2-Dichloropropane	µg/L	5		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,3-Dichlorobenzene	µg/L	3,100		< 0.4	U	< 0.4	U	< 0.4	U			< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3-Dichloropropane	µg/L	29		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,4-Dichlorobenzene	µg/L	75		< 0.4	U	< 0.4	U	< 0.4	U			< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
2,2-Dichloropropane	µg/L	42		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
2-Butanone	µg/L	61,000		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Chlorotoluene	µg/L	2,000		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
2-Hexanone	µg/L	6,100		< 1	U	< 1	U	< 1	U			< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
4-Chlorotoluene	µg/L	2,000		< 0.4	U	< 0.4	U	< 0.4	U			< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U

Table 2-3
Groundwater Results 2018-2019

		Location Code	67WW01	67WW01		67WW02				67WW03		67WW05						67WW07				67WW08					
		Sample ID		67WW01-190503		67WW02-181025		67WW02-190501				67WW05-181025		67WW05-181025-		67WW05-190502		67WW07-181025		67WW07-190503		67WW08-181023		67WW08-181023-		67WW08-190501	
		Sample Date	10/25/2019	5/3/2019		10/25/2018		5/1/2019		10/22/2019	5/2/2019	10/25/2018		10/25/2018		5/2/2019		10/25/2018		5/3/2019		10/23/2018		10/23/2018		5/1/2019	
		Depth		22.97 - 23.23		24.35 - 24.6		22.42 - 22.67				25.8 - 26.07		25.8 - 26.07		24.46 - 24.68		24.94 - 25.19		21.72 - 21.95		24.41 - 24.62		24.41 - 24.62		21.67 - 21.9	
		Sample Purpose		REG		REG		REG				REG		FD		REG		REG		REG		REG		FD		REG	
Parameter	Units	MCL / GW-Ind		Result	Val Qual	Result	Val Qual	Result	Val Qual			Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Acetone	µg/L	92,000		< 0.4	U	< 2	U	< 0.4	U			< 2	U	< 2	U	< 0.4	U	< 2	U	< 0.4	U	< 2	U	< 2	U	< 0.4	U
Benzene	µg/L	5		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromobenzene	µg/L	2,000		< 0.4	U	< 0.4	U	< 0.4	U			< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromochloromethane	µg/L	4,100		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromodichloromethane	µg/L	4.6		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromoform	µg/L	36		< 0.4	U	< 0.4	U	< 0.4	U			< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromomethane	µg/L	140		< 0.4	U	< 0.4	U	< 0.4	U			< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Carbon disulfide	µg/L	10,000		< 0.6	U	< 0.6	U	< 0.6	U			< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U
Carbon tetrachloride	µg/L	5		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Chloroethane	µg/L	41,000		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Chloroform	µg/L	1,000		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Chloromethane	µg/L	220		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
cis-1,2-Dichloroethene	µg/L	70		0.86	J	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
cis-1,3-Dichloropropene	µg/L	5.3		< 0.1	U	< 0.1	U	< 0.1	U			< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U
Dibromochloromethane	µg/L	34		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Dibromomethane	µg/L	380		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Dichlorodifluoromethane	µg/L	20,000		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	UJ	< 0.3	UJ	< 0.3	U
Ethylbenzene	µg/L	700		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Hexachlorobutadiene	µg/L	20		< 1	U	< 1	U	< 1	U			< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Isopropylbenzene	µg/L	10,000		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
m,p-Xylenes	µg/L	10,000		< 0.5	U	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Methyl isobutyl ketone	µg/L	8,200		< 0.7	U	< 0.7	U	< 0.7	U			< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U
Methylene chloride	µg/L	5		< 0.4	U	< 1	U	< 0.4	U			< 1	U	< 1	U	< 0.4	U	< 1	U	< 0.4	U	< 1	U	< 1	U	< 0.4	U
Naphthalene	µg/L	2,000		< 0.3	U	< 0.3	UJ	< 0.3	U			< 0.3	UJ	< 0.3	U	< 0.3	U	< 0.3	UJ	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
n-Butylbenzene	µg/L	4,100		< 0.4	U	< 0.4	U	< 0.4	U			< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Propylbenzene	µg/L	4,100		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
o-Xylene	µg/L	10,000		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
p-Isopropyltoluene	µg/L	10,000		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
sec-Butylbenzene	µg/L	4,100		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Styrene	µg/L	100		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
tert-Butylbenzene	µg/L	4,100		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Tetrachloroethene	µg/L	5		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Toluene	µg/L	1,000		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
trans-1,2-Dichloroethene	µg/L	100		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
trans-1,3-Dichloropropene	µg/L	29		< 0.2	U	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Trichloroethene	µg/L	5		1.3		< 0.2	U	0.87	J			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Trichlorofluoromethane	µg/L	31,000		< 0.3	U	< 0.3	U	< 0.3	U			< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Vinyl chloride	µg/L	2		0.92	J	< 0.2	U	< 0.2	U			< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U

Table 2-3
Groundwater Results 2018-2019

		Location Code	67WW09				67WW09A				67WW10				67WW11				67WW12				67WW13					
		Sample ID	67WW09-181023		67WW09-190503		67WW09A-181025		67WW09A-190502		67WW10-181022		67WW10-190502		67WW11-181023		67WW11-190501		67WW12-181022		67WW12-190502		67WW13-181023		67WW13-190501		67WW13-190501-	
		Sample Date	10/23/2018		5/3/2019		10/25/2018		5/2/2019		10/22/2018		5/2/2019		10/23/2018		5/1/2019		10/22/2018		5/2/2019		10/23/2018		5/1/2019		5/1/2019	
		Depth	22.43 - 22.65		19.83 - 20.06		27.02 - 27.26		24.35 - 24.58		25.65 - 25.88		22.31 - 22.53		23.95 - 24.2		21.21 - 21.44		26.3 - 26.55		23.85 - 24.05		22.38 - 22.62		20.18 - 20.4		20.18 - 20.4	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																												
Chloride	mg/L																						1,420		1,240		1,300	
Nitrate	mg/L	10																					< 0.06	U	0.697		0.657	
Nitrogen, Nitrite (As N)	mg/L																						< 0.06	U				
Sulfate	mg/L																						355		284		318	
Sulfide	mg/L																						2.28					
DHC																												
Dehalococcoides	CEQ/mL																						0.4	J				
FIELD TESTS																												
Conductivity	μS/cm		3.35		3.49		3.26		3.42		5.17		5.80		4.99		4.65		5.24		3.56		5.39		4.83			
Dissolved oxygen	mg/L		0.1		0.13		0.05		0.09		0.18		0.06		0.07		0.5		0.29		0.61		0.19		2.77			
Oxidation-reduction potential	mV		203		250		138		123		178		157		171		195		209		187		281		209			
pH	SU		6.23		5.36		6.04		6.0		5.51		5.37		6.45		5.29		5.68		5.35		5.78		5.48			
Temperature	C		18.75		20.04		17.79		20.8		18.54		20.46		18.02		20.6		18.77		20.12		18.49		21.37			
Turbidity	NTU		0		0		0		24		31.2		25.4		1.9		7.8		0		6.3		0		0			
GASES																												
Carbon dioxide	μg/L																						620,000		840,000		860,000	
Ethane	μg/L																						< 0.16	U	< 0.16	U	< 0.16	U
Ethylene	μg/L																						< 0.24	U	< 0.24	U	< 0.24	U
Methane	μg/L																						< 0.51	U	< 0.51	U	< 0.51	U
GEN CHEMISTRY																												
Alkalinity	mg/L																						368					
Total inorganic carbon	mg/L																						130					
Total organic carbon	mg/L																						3.99		2.91		3.24	
METALS																												
Ferrous Iron	mg/L																						0.035	J	0.00	U	0.00	U
VOLATILES																												
1,1,1,2-Tetrachloroethane	μg/L	110	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,1,1-Trichloroethane	μg/L	200	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
1,1,2,2-Tetrachloroethane	μg/L	14	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	μg/L	3,100,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	μg/L	5	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	6.1		3.9		3.8	
1,1-Dichloroethane	μg/L	10,000	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	3.8		1.9	J	< 0.2	U	< 0.2	U	32		14		13	
1,1-Dichloroethene	μg/L	7	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	6.1		2.8		4.8		2.1		570		200		160	
1,1-Dichloropropene	μg/L	2.9	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichlorobenzene	μg/L	310	< 0.4	U	< 0.4	U	< 0.4	UJ	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,2,3-Trichloropropane	μg/L	0.041	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	μg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	μg/L	5,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2-Dibromo-3-chloropropane	μg/L	0.2	< 1	U	< 0.2	U	< 1	U	< 0.2	U	< 1	U	< 0.2	U	< 1	U	< 0.2	U	< 1	U	< 0.2	U	< 1	U	< 0.2	U	< 0.2	U
1,2-Dibromoethane	μg/L	0.05	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
1,2-Dichlorobenzene	μg/L	600	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	μg/L	5	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	43		24		23	
1,2-Dichloropropane	μg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	μg/L	5,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,3-Dichlorobenzene	μg/L	3,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3-Dichloropropane	μg/L	29	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,4-Dichlorobenzene	μg/L	75	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
2,2-Dichloropropane	μg/L	42	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
2-Butanone	μg/L	61,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Chlorotoluene	μg/L	2,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
2-Hexanone	μg/L	6,100	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
4-Chlorotoluene	μg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U

Table 2-3
Groundwater Results 2018-2019

		Location Code	67WW09				67WW09A				67WW10				67WW11				67WW12				67WW13					
		Sample ID	67WW09-181023		67WW09-190503		67WW09A-181025		67WW09A-190502		67WW10-181022		67WW10-190502		67WW11-181023		67WW11-190501		67WW12-181022		67WW12-190502		67WW13-181023		67WW13-190501		67WW13-190501-	
		Sample Date	10/23/2018		5/3/2019		10/25/2018		5/2/2019		10/22/2018		5/2/2019		10/23/2018		5/1/2019		10/22/2018		5/2/2019		10/23/2018		5/1/2019		5/1/2019	
		Depth	22.43 - 22.65		19.83 - 20.06		27.02 - 27.26		24.35 - 24.58		25.65 - 25.88		22.31 - 22.53		23.95 - 24.2		21.21 - 21.44		26.3 - 26.55		23.85 - 24.05		22.38 - 22.62		20.18 - 20.4		20.18 - 20.4	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Acetone	µg/L	92,000	< 2	U	< 0.4	U	< 2	U	< 0.4	U	< 2	U	< 0.4	U	< 2	U	5.6		< 2	U	< 0.4	U	< 2	U	< 0.4	U	< 0.4	U
Benzene	µg/L	5	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromobenzene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromochloromethane	µg/L	4,100	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	UJ	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromodichloromethane	µg/L	4.6	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromoform	µg/L	36	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromomethane	µg/L	140	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Carbon disulfide	µg/L	10,000	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Chloroethane	µg/L	41,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Chloroform	µg/L	1,000	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	UJ	< 0.2	U	< 0.2	U	1.4		< 0.2	U	< 0.2	U
Chloromethane	µg/L	220	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
cis-1,2-Dichloroethene	µg/L	70	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	UJ	< 0.2	U	< 0.2	U	1.9		0.94	J	0.81	J
cis-1,3-Dichloropropene	µg/L	5.3	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U
Dibromochloromethane	µg/L	34	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Dibromomethane	µg/L	380	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Dichlorodifluoromethane	µg/L	20,000	< 0.3	UJ	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	UJ	< 0.3	U	< 0.3	UJ	< 0.3	U	< 0.3	UJ	< 0.3	U	< 0.3	UJ	< 0.3	U	< 0.3	U
Ethylbenzene	µg/L	700	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Hexachlorobutadiene	µg/L	20	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Isopropylbenzene	µg/L	10,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
m,p-Xylenes	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Methyl isobutyl ketone	µg/L	8,200	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U
Methylene chloride	µg/L	5	< 1	U	< 0.4	U	< 1	U	< 0.4	U	< 1	U	< 0.4	U	< 1	U	< 0.4	U	< 1	U	< 0.4	U	< 1	U	< 0.4	U	< 0.4	U
Naphthalene	µg/L	2,000	< 0.3	U	< 0.3	U	< 0.3	UJ	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
n-Butylbenzene	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Propylbenzene	µg/L	4,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
o-Xylene	µg/L	10,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
p-Isopropyltoluene	µg/L	10,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
sec-Butylbenzene	µg/L	4,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Styrene	µg/L	100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
tert-Butylbenzene	µg/L	4,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Tetrachloroethene	µg/L	5	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Toluene	µg/L	1,000	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
trans-1,2-Dichloroethene	µg/L	100	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
trans-1,3-Dichloropropene	µg/L	29	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Trichloroethene	µg/L	5	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	2.4		1.1		1	
Trichlorofluoromethane	µg/L	31,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Vinyl chloride	µg/L	2	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U

Table 2-3
Groundwater Results 2018-2019

		Location Code	67WW14				67WW15				67WW16I			
		Sample ID	67WW14-181022		67WW14-190502		67WW15-181023		67WW15-190503		67WW16I-181025		67WW16I-190501	
		Sample Date	10/22/2018		5/2/2019		10/23/2018		5/3/2019		10/25/2018		5/1/2019	
		Depth	20.85 - 21.08		18.78 - 19.02		24.23 - 24.44		22.04 - 22.23		24.03 - 24.22		21.8 - 21.98	
		Sample Purpose	REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS														
Chloride	mg/L													
Nitrate	mg/L	10												
Nitrogen, Nitrite (As N)	mg/L													
Sulfate	mg/L													
Sulfide	mg/L													
DHC														
Dehalococcoides	CEQ/mL													
FIELD TESTS														
Conductivity	µS/cm		2.09		2.17		1.80		1.93		1.53		1.50	
Dissolved oxygen	mg/L		0.66		0.27		0.16		2.85		0.14		1.63	
Oxidation-reduction potential	mV		274		228		253		231		41		18	
pH	SU		5.76		5.89		5.61		5.43		6.24		5.35	
Temperature	C		21.68		20.83		18.06		20.33		17.69		22.48	
Turbidity	NTU		0		30.6		2.1		0		7.6		1.9	
GASES														
Carbon dioxide	µg/L													
Ethane	µg/L													
Ethylene	µg/L													
Methane	µg/L													
GEN CHEMISTRY														
Alkalinity	mg/L													
Total inorganic carbon	mg/L													
Total organic carbon	mg/L													
METALS														
Ferrous Iron	mg/L													
VOLATILES														
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,1,1-Trichloroethane	µg/L	200	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.3	U	< 0.3	U	6		5.4		< 0.3	U	< 0.3	U
1,1-Dichloroethane	µg/L	10,000	1.3		1.4		13		9.2		< 0.2	U	< 0.2	U
1,1-Dichloroethene	µg/L	7	6.6		5.3		670		330		< 0.2	U	< 0.2	U
1,1-Dichloropropene	µg/L	2.9	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	UJ	< 0.4	U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 1	U	< 0.2	U	< 1	U	< 0.2	U	< 1	U	< 0.2	U
1,2-Dibromoethane	µg/L	0.05	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
1,2-Dichlorobenzene	µg/L	600	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	2.5		1.8		30		22		< 0.2	U	< 0.2	U
1,2-Dichloropropane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3-Dichloropropane	µg/L	29	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,4-Dichlorobenzene	µg/L	75	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
2,2-Dichloropropane	µg/L	42	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
2-Butanone	µg/L	61,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Chlorotoluene	µg/L	2,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
2-Hexanone	µg/L	6,100	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U

Table 2-3
Groundwater Results 2018-2019

		Location Code	67WW14				67WW15				67WW16I			
		Sample ID	67WW14-181022		67WW14-190502		67WW15-181023		67WW15-190503		67WW16I-181025		67WW16I-190501	
		Sample Date	10/22/2018		5/2/2019		10/23/2018		5/3/2019		10/25/2018		5/1/2019	
		Depth	20.85 - 21.08		18.78 - 19.02		24.23 - 24.44		22.04 - 22.23		24.03 - 24.22		21.8 - 21.98	
		Sample Purpose	REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Acetone	µg/L	92,000	< 2	U	< 0.4	U	< 2	U	< 0.4	U	< 2	U	3.3	
Benzene	µg/L	5	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromobenzene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromochloromethane	µg/L	4,100	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromodichloromethane	µg/L	4.6	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Bromoform	µg/L	36	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromomethane	µg/L	140	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Carbon disulfide	µg/L	10,000	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	< 0.6	U	0.9	J
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Chloroethane	µg/L	41,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Chloroform	µg/L	1,000	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Chloromethane	µg/L	220	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
cis-1,2-Dichloroethene	µg/L	70	< 0.2	U	< 0.2	U	1.7		1.3		< 0.2	U	< 0.2	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.1	U
Dibromochloromethane	µg/L	34	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Dibromomethane	µg/L	380	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Dichlorodifluoromethane	µg/L	20,000	< 0.3	UJ	< 0.3	U	< 0.3	UJ	< 0.3	U	< 0.3	U	< 0.3	U
Ethylbenzene	µg/L	700	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Hexachlorobutadiene	µg/L	20	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Isopropylbenzene	µg/L	10,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
m,p-Xylenes	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Methyl isobutyl ketone	µg/L	8,200	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U	< 0.7	U
Methylene chloride	µg/L	5	< 1	U	< 0.4	U	< 1	U	< 0.4	U	< 1	U	< 0.4	U
Naphthalene	µg/L	2,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	UJ	< 0.3	U
n-Butylbenzene	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Propylbenzene	µg/L	4,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
o-Xylene	µg/L	10,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
p-Isopropyltoluene	µg/L	10,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
sec-Butylbenzene	µg/L	4,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Styrene	µg/L	100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
tert-Butylbenzene	µg/L	4,100	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Tetrachloroethene	µg/L	5	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Toluene	µg/L	1,000	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
trans-1,2-Dichloroethene	µg/L	100	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
trans-1,3-Dichloropropene	µg/L	29	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U
Trichloroethene	µg/L	5	< 0.2	U	< 0.2	U	1.4		1.1		< 0.2	U	< 0.2	U
Trichlorofluoromethane	µg/L	31,000	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
Vinyl chloride	µg/L	2	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U

Notes:
Bold and highlighted results indicate analyte is above the Res-GW MCL.
µS/cm - microsiemens per centimeter
µg/L - micrograms per liter
°C - degrees Celsius
cells/mL - cells per milliliter
CEQ/mL - cell equivalence per milliliter
DHC - Dehalococcoides
FD - field duplicate
GW-Ind - groundwater medium-specific concentration for industrial use
ID - identification
J - estimated value
MCL - maximum contaminant level
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter
mV - millivolts
NR - not recorded
NTU - nephelometric turbidity unit
REG - regular sample
Res-GW MCL - residential groundwater MCL
SU - standard unit
U - Not detected; The analyte was analyzed for but not detected above the associated method detection limit.
Val Qual - validation qualifier
VOC - volatile organic compound

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW01																					
		Sample ID	67WW01-050113		67WW01-053113		67WW01-050714		67WW01-072514		67WW01-120314		67WW01-021015		67WW01-051915		67WW01-111915		67WW01-032916		67WW01-051916		67WW01-112817	
		Sample Date	5/1/2013		5/31/2013		5/7/2014		7/25/2014		12/3/2014		2/10/2015		5/19/2015		11/19/2015		3/29/2016		5/19/2016		11/28/2017	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		25.95 - 25.99	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																								
Chloride	mg/L						981								988									
Nitrate	mg/L	10					< 1	U							< 1	U								
Nitrite	mg/L	1					< 1	U							2.02									
DHC																								
BVC	CEQ/mL						0.5	U																
Dehalococcoides	cells/mL						4.7																	
FIELD TESTS																								
Conductivity	µS/cm				3.41		3.57		3.57		3.69		3.36		3.2		3.95		3.8		3.9		3.77	
Dissolved oxygen	mg/L				8.62		8.81		8.79		NR		NR		NR		NR		NR		NR		NR	
Oxidation-Reduction Potential	mV				15		85		107		-13		-101		-52								19	
pH	SU				5.84		5.52		5.91		6.15		6.92		7.11		6.19		5.57		6.28		6.47	
Temperature	C				28		19.77		21.9		17.6		18.85		21.65		16.27		15.38		17.86		17.22	
Turbidity	NTU				69.6		36.6		33		23.3		194		161		284		50.2		26.2		184	
GASES																								
Carbon dioxide	µg/L																							
Ethane	µg/L						< 2	U							< 2	U								
Ethylene	µg/L						< 2	U							< 2	U								
Methane	µg/L						33.5								20									
GENERAL CHEMISTRY																								
Ferrous Iron	mg/L						5,690								53.9									
SULFIDE																								
Sulfide	mg/L						< 1	U							< 1	U								
TOTAL ORGANIC CARBON																								
Total Inorganic Carbon	mg/L																							
Total organic carbon	mg/L						5.25								12.7									
VOLATILES																								
1,1,1,2-Tetrachloroethane	µg/L	110			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
1,1,1-Trichloroethane	µg/L	200			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
1,1,2,2-Tetrachloroethane	µg/L	14			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 1	U	< 0.4	U	< 2	U	< 1	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000																					< 1	U
1,1,2-Trichloroethane	µg/L	5			< 0.25	U	< 0.5	U	0.29	J	0.483	J	1.44		1.72	J	2.14	J	2.67		1.62	J	< 1	U
1,1-Dichloroethane	µg/L	10,000			6.37		11		9.2		14.9		23.7		23.5		26.2		38.5		27.6		22	
1,1-Dichloroethene	µg/L	7			139		257		224		349		544		631		694		728		714		250	
1,1-Dichloropropene	µg/L	2.9			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
1,2,3-Trichlorobenzene	µg/L	310			< 0.15	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.75	U	< 0.75	U	< 0.3	U	< 1.5	U	< 1	U
1,2,3-Trichloropropane	µg/L	0.041			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 1	U	< 0.4	U	< 2	U	< 1	U
1,2,4-Trimethylbenzene	µg/L	5,100			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
1,2-Dibromo-3-chloropropane	µg/L	0			< 1	U	< 2	U	< 2	U	< 2	U	< 2	U	< 5	U	< 5	U	< 2	U	< 10	U	< 1	U
1,2-Dibromoethane	µg/L	0			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
1,2-Dichlorobenzene	µg/L	600			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U
1,2-Dichloroethane	µg/L	5			6.68		12.2		10.7		16.6		28.7		31.4		38.6		52.6		43.3		28	
1,2-Dichloropropane	µg/L	5			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 1	U	< 0.4	U	< 2	U	< 1	U
1,3,5-Trimethylbenzene	µg/L	5,100			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
1,3-Dichlorobenzene	µg/L	3,100			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
1,3-Dichloropropane	µg/L	29			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 1	U	< 0.4	U	< 2	U	< 1	U
1,4-Dichlorobenzene	µg/L	75			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U
2,2-Dichloropropane	µg/L	42			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
2-Butanone	µg/L	61,000			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 12.5	U	< 12.5	U	< 5	U	< 25	U	< 2	U
2-Chlorotoluene	µg/L	2,000			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW01																					
		Sample ID	67WW01-050113		67WW01-053113		67WW01-050714		67WW01-072514		67WW01-120314		67WW01-021015		67WW01-051915		67WW01-111915		67WW01-032916		67WW01-051916		67WW01-112817	
		Sample Date	5/1/2013		5/31/2013		5/7/2014		7/25/2014		12/3/2014		2/10/2015		5/19/2015		11/19/2015		3/29/2016		5/19/2016		11/28/2017	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		25.95 - 25.99	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 12.5	U	< 12.5	U	< 5	U	< 25	U	< 2	U
4-Chlorotoluene	µg/L	2,000			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Acetone	µg/L	92,000			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 12.5	U	< 12.5	U	< 5	U	< 25	U	< 2	U
Benzene	µg/L	5			< 0.125	U	< 0.14	B	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	0.168	J	< 1.25	U	< 1	U
Bromobenzene	µg/L	2,000			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U
Bromochloromethane	µg/L	4,100			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 1	U	< 0.4	U	< 2	U	< 1	U
Bromodichloromethane	µg/L	4.6			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Bromoform	µg/L	36			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 1	U
Bromomethane	µg/L	140			< 0.5	U	< 1	U	< 1	U	< 1	U	1	UJ	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 1	U
Carbon disulfide	µg/L	10,000			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 2	U
Carbon tetrachloride	µg/L	5			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	2.5	UJ	< 1	U
Chlorobenzene	µg/L	100			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U
Chloroethane	µg/L	41,000			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 1	U
Chloroform	µg/L	1,000			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U
Chloromethane	µg/L	220			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 1	U
cis-1,2-Dichloroethene	µg/L	70			1.12		1.29		1.02		1.26		1.82		1.54	J	1.6	J	2.16		1.47	J	1.3	
cis-1,3-Dichloropropene	µg/L	5.3			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Dibromochloromethane	µg/L	34			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Dibromomethane	µg/L	380			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Dichlorodifluoromethane	µg/L	20,000			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Ethylbenzene	µg/L	700			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Hexachlorobutadiene	µg/L	20			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	2.5	UJ	< 1	U
Isopropylbenzene	µg/L	10,000			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
m,p-Xylenes	µg/L	10,000			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 2	U
Methyl isobutyl ketone	µg/L	8,200			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 12.5	U	< 12.5	U	< 5	U	< 25	U	< 2	U
Methylene chloride	µg/L	5			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 2	U
Naphthalene	µg/L	2,000			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 1	U	< 0.4	U	< 2	U	< 1	U
n-Butylbenzene	µg/L	4,100			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
n-Propylbenzene	µg/L	4,100			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U
o-Xylene	µg/L	10,000			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
p-Isopropyltoluene	µg/L	10,000			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
sec-Butylbenzene	µg/L	4,100			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Styrene	µg/L	100			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.25	U	< 1.25	U	< 1	U
tert-Butylbenzene	µg/L	4,100			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Tetrachloroethene	µg/L	5			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Toluene	µg/L	1,000			< 0.25	U	< 0.5	U	0.473	J	0.398	J	0.287	J	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
trans-1,2-Dichloroethene	µg/L	100			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
trans-1,3-Dichloropropene	µg/L	29			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 1	U	< 5	U	< 1	U
Trichloroethene	µg/L	5			2.96		3		2.3		3.36		4.07		3.03		2.84		4		3.28	J	2.1	
Trichlorofluoromethane	µg/L	31,000			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 0.5	U	< 2.5	U	< 1	U
Vinyl chloride	µg/L	2			2.18		2.15		1.16		2.16		2.38		1.86	J	2.38	J	3.64		2.98	J	< 1	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW01				67WW02																			
		Sample ID	67WW01-180503		67WW01-190503		67WW02-050213		67WW02-053113		67WW02-092713		67WW02-012314		67WW02-050614		67WW02-072414		67WW02-120314		67WW02-021015		67WW02FD-051215		67WW02-051215	
		Sample Date	5/3/2018		5/3/2019		5/2/2013		5/31/2013		9/27/2013		1/23/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		5/12/2015	
		Depth	24 - 24		22.97 - 23.23		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		3.37		3.67		3.25		3.02		2.94		3.04		3		2.94		3.07		2.92					
Dissolved oxygen	mg/L		NR		0.46		3.4		8.68		10.06		5.81		6.54		8.83									
Oxidation-Reduction Potential	mV		73		202		92		-8		73		-65		47		192		61		-30					
pH	SU		6.61		6.17		5.72		6.57		6.69		6.78		5.62		7.02		6.27		7.25					
Temperature	C		19.98		19.81		20.58		27.07		25.23		16.2		21.01		22.38		19		19.49					
Turbidity	NTU		67.6		100		78.4		51.4		21		49.7		106		11.6		19.3		8.9					
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5	U	< 0.5	U			0.2	UJ	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000	< 0.5	U	< 0.5	U																				
1,1,2-Trichloroethane	µg/L	5	1.2		1.4				< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	15		12				0.507	J	0.508	J	0.406	J	0.44	J	0.335	J	0.406	J	0.592	J	0.873	J	0.883	J
1,1-Dichloroethene	µg/L	7	450		280				< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	3.59		13		13.2	
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5	U	< 0.5	U			< 0.15	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5	U	< 0.5	U			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5	U	< 0.5	U			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 0.5	U	< 0.5	U			< 1	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
1,2-Dichloroethane	µg/L	5	22		21				< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.5	U	< 0.5	U			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.5	U	< 0.5	U			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,4-Dichlorobenzene	µg/L	75	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 1	U	< 1	U			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ
2-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW01				67WW02																			
		Sample ID	67WW01-180503		67WW01-190503		67WW02-050213		67WW02-053113		67WW02-092713		67WW02-012314		67WW02-050614		67WW02-072414		67WW02-120314		67WW02-021015		67WW02FD-051215		67WW02-051215	
		Sample Date	5/3/2018		5/3/2019		5/2/2013		5/31/2013		9/27/2013		1/23/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		5/12/2015	
		Depth	24 - 24		22.97 - 23.23		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 1	U	< 1	U			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	5	UJ
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 1	U	< 1	U			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
Benzene	µg/L	5	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromobenzene	µg/L	2,000	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromochloromethane	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 0.5	U	< 0.5	U			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Bromomethane	µg/L	140	< 0.5	U	< 0.5	U			0.5	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	1	UJ	< 1	U	< 1	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloroethane	µg/L	41,000	< 0.5	U	< 0.5	U			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Chloroform	µg/L	1,000	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloromethane	µg/L	220	< 0.5	U	< 0.5	U			0.5	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	70	0.95	J	0.86	J			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U			0.25	UJ	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 1	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 1	U	< 1	U			< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	5	UJ
Methylene chloride	µg/L	5	< 1	U	< 1	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Naphthalene	µg/L	2,000	< 0.5	U	< 0.5	U			< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.5	U	< 0.5	U			< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 0.5	U	< 0.5	U			< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Trichloroethene	µg/L	5	1.7		1.3				< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	1.4		0.92	J			< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW02																67WW03						67WW05	
		Sample ID	67WW02-111915		67WW02FD-051916		67WW02-051916		67WW02-112817		67WW02-180503FD		67WW02-180503		67WW02-181025		67WW02-190501		67WW03-051215		67WW03-032916		67WW03-051916		67WW05-053113	
		Sample Date	11/19/2015		5/19/2016		5/19/2016		11/28/2017		5/3/2018		5/3/2018		10/25/2018		5/1/2019		5/12/2015		3/29/2016		5/19/2016		5/31/2013	
		Depth	0 - 0		0 - 0		0 - 0		23.95 - 27.78		24.15 - 24.15		24.15 - 24.15		24.35 - 24.6		22.42 - 22.67		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		FD		REG		REG		FD		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		3.33				3.8		4.26				3.87		4.0		4.03									
Dissolved oxygen	mg/L								7.82				8.6		1.27		0.27									
Oxidation-Reduction Potential	mV								90				155		129		73									
pH	SU		6.29				6.08		6.12				6.37		6.5		5.74									
Temperature	C		17.57				18.37		15.93				20.69		19.04		24									
Turbidity	NTU		49.3				10.6		20.9				14.3		1.1		0									
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.2	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000							< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U								
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	1.2		< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,1-Dichloroethane	µg/L	10,000	0.302	J	3.25		3.27		< 1	U	7.7		7.8		< 0.5	U	8.4		< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
1,1-Dichloroethene	µg/L	7	0.857	J	66.3		67.6		< 1	U	190		190		6.9		180		< 1	U	< 1	U	< 1	U	< 0.5	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	UJ	< 0.5	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.15	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.2	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 2	U	< 2	U	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 2	U	< 2	U	< 2	U	< 1	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	0.321	J	0.377	J	< 1	U	1.9		2		< 0.5	U	4.7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.2	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.2	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U	< 5	U	< 2.5	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW02																67WW03						67WW05	
		Sample ID	67WW02-111915		67WW02FD-051916		67WW02-051916		67WW02-112817		67WW02-180503FD		67WW02-180503		67WW02-181025		67WW02-190501		67WW03-051215		67WW03-032916		67WW03-051916		67WW05-053113	
		Sample Date	11/19/2015		5/19/2016		5/19/2016		11/28/2017		5/3/2018		5/3/2018		10/25/2018		5/1/2019		5/12/2015		3/29/2016		5/19/2016		5/31/2013	
		Depth	0 - 0		0 - 0		0 - 0		23.95 - 27.78		24.15 - 24.15		24.15 - 24.15		24.35 - 24.6		22.42 - 22.67		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		FD		REG		REG		FD		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U	< 5	U	< 2.5	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 2	U	< 1	U	< 5	U	< 5	U	< 5	U	2.5	UJ
Benzene	µg/L	5	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.2	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Bromomethane	µg/L	140	< 1	U	1	UJ	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Chlorobenzene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
Chloromethane	µg/L	220	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U	< 5	U	< 2.5	U
Methylene chloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Naphthalene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	UJ	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.2	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	0.411	J	0.456	J	< 0.5	U	< 0.25	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Styrene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.125	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	0.87	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Vinyl chloride	µg/L	2	< 0.5	U	0.273	J	0.285	J	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW05																							
		Sample ID	67WW05-092813		67WW05-012314		67WW05-050614		67WW05-072414		67WW05-120314		67WW05-021015		67WW05-051215		67WW05-111915		67WW05-051916		67WW05-112817		67WW05-180503		67WW05-181025-FD	
		Sample Date	9/28/2013		1/23/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		11/19/2015		5/19/2016		11/28/2017		5/3/2018		10/25/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		25.6 - 25.6		25.08 - 25.08		25.8 - 26.07	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L						697																			
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm																				2.75		2.45			
Dissolved oxygen	mg/L																				7.47		9.51			
Oxidation-Reduction Potential	mV																				133		229			
pH	SU																				5.26		5.68			
Temperature	C																				16.09		20.63			
Turbidity	NTU																				301		54			
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000																			< 1	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 1	U	< 0.5	U	< 0.5	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 1	U	< 0.5	U	< 1	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW05																					
		Sample ID	67WW05-092813		67WW05-012314		67WW05-050614		67WW05-072414		67WW05-120314		67WW05-021015		67WW05-051215		67WW05-111915		67WW05-051916		67WW05-112817		67WW05-180503		67WW05-181025-FD	
		Sample Date	9/28/2013		1/23/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		11/19/2015		5/19/2016		11/28/2017		5/3/2018		10/25/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		25.6 - 25.6		25.08 - 25.08		25.8 - 26.07	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 2	U
Benzene	µg/L	5	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Chloromethane	µg/L	220	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U
Methylene chloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2	U	< 1	U	< 1	U
Naphthalene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW05				67WW06														67WW07					
		Sample ID	67WW05-181025		67WW05-190502		67WW06-043013		67WW06-053113		67WW06-053113-FD		67WW06-092813		67WW06-012414		67WW06-161215		67WW06-112917		67WW07-053113		67WW07-092713		67WW07-012314	
		Sample Date	10/25/2018		5/2/2019		4/30/2013		5/31/2013		5/31/2013		9/28/2013		1/24/2014		12/16/2015		11/29/2017		5/31/2013		9/27/2013		1/23/2014	
		Depth	25.8 - 26.07		24.46 - 24.68		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		24.66 - 24.87		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		FD		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		2.75		2.65		6.38		6.37				6.45		7.09		6.13		5.36							
Dissolved oxygen	mg/L		0.11		1.99		0		1.57				0.82		0.8		0		0.1							
Oxidation-Reduction Potential	mV		172		247		82		22				13		67		56		204							
pH	SU		5.17		4.11		5.01		5.27				5.45		5.58		5.74		5.11							
Temperature	C		17.93		20.1		24.95		24.28				20.2		15.42		19.27		18.57							
Turbidity	NTU		21.3		55.2		9.7		13.4				5.5		42.9		36.2		150							
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5	U	< 0.5	U			< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U			< 1	U	0.2	UJ	< 0.4	U	< 0.4	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000	< 0.5	U	< 0.5	U													< 1	U						
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	< 0.5	U	< 0.5	U			0.212	J	0.193	J	< 0.25	U	0.234	J			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 1	U	0.752	J			< 1	U	< 0.5	U	< 1	U	< 1	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5	UJ	< 0.5	U			< 0.15	U	< 0.15	U	< 0.3	U	< 0.3	U			< 1	U	< 0.15	U	< 0.3	U	< 0.3	U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 1	U	< 1	U			< 1	U	< 0.5	U	< 1	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5	U	< 0.5	U			< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U			< 1	U	< 0.2	U	< 0.4	U	< 0.4	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 1	U	< 0.5	U			< 1	U	< 1	U	< 2	U	2	UJ			< 1	U	1	UJ	< 2	U	< 2	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U			2.25		2.2		1.77		2.03				1		1.67		1.77		1.35	
1,2-Dichloropropane	µg/L	5	< 0.5	U	< 0.5	U			< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U			< 1	U	< 0.2	U	< 0.4	U	< 0.4	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.5	U	< 0.5	U			< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U			< 1	U	< 0.2	U	< 0.4	U	< 0.4	U
1,4-Dichlorobenzene	µg/L	75	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 1	U	< 1	U			< 2.5	U	< 2.5	U	< 5	U	< 5	U			< 2	U	< 2.5	U	< 5	U	< 5	U
2-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW05				67WW06														67WW07					
		Sample ID	67WW05-181025		67WW05-190502		67WW06-043013		67WW06-053113		67WW06-053113-FD		67WW06-092813		67WW06-012414		67WW06-161215		67WW06-112917		67WW07-053113		67WW07-092713		67WW07-012314	
		Sample Date	10/25/2018		5/2/2019		4/30/2013		5/31/2013		5/31/2013		9/28/2013		1/24/2014		12/16/2015		11/29/2017		5/31/2013		9/27/2013		1/23/2014	
		Depth	25.8 - 26.07		24.46 - 24.68		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		24.66 - 24.87		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		FD		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 1	U	< 1	U			< 2.5	U	< 2.5	U	< 5	U	< 5	U			< 2	U	< 2.5	U	< 5	U	< 5	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 2	U	< 3.8	U			2.5	UJ	2.5	UJ	< 5	U	< 5	U			< 2	U	< 2.5	U	< 5	U	< 5	U
Benzene	µg/L	5	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
Bromobenzene	µg/L	2,000	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
Bromochloromethane	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U			< 1	U	< 0.2	U	< 0.4	U	< 0.4	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 1	U	< 1	U			< 1	U	< 0.5	U	< 1	U	< 1	U
Bromomethane	µg/L	140	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	1	UJ	< 1	U			< 1	U	0.5	UJ	< 1	U	< 1	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U			< 0.5	U	< 0.5	U	< 1	U	< 1	U			< 2	U	< 0.5	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
Chloroethane	µg/L	41,000	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 1	U	< 1	U			< 1	U	< 0.5	U	< 1	U	< 1	U
Chloroform	µg/L	1,000	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
Chloromethane	µg/L	220	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 1	U	< 1	U			< 1	U	0.5	UJ	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 1	U	< 1	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U			< 0.5	U	< 0.5	U	< 1	U	< 1	U			< 2	U	< 0.5	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 1	U	< 1	U			< 2.5	U	< 2.5	U	< 5	U	< 5	U			< 2	U	< 2.5	U	< 5	U	< 5	U
Methylene chloride	µg/L	5	< 1	U	< 1	U			0.918	J	0.846	J	0.966	J	< 0.5	U			< 2	U	< 0.25	U	< 0.5	U	< 0.5	U
Naphthalene	µg/L	2,000	< 0.5	UJ	< 0.5	U			< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U			< 1	U	< 0.2	U	< 0.4	U	< 0.4	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.5	U	< 0.5	U			< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U			< 1	U	< 0.125	U	< 0.25	U	< 0.25	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 0.5	U	< 0.5	U			< 0.5	U	< 0.5	U	< 1	U	< 1	U			< 1	U	< 0.5	U	< 1	U	< 1	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U			< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U			< 1	U	< 0.25	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW07																						67WW08	
		Sample ID	67WW07-050614		67WW07-072514		67WW07-120314		67WW07-021015		67WW07-051215		67WW07-111915		67WW07-051916		67WW07-112917		67WW07-180503		67WW07-181025		67WW07-190503		67WW08-060313	
		Sample Date	5/6/2014		7/25/2014		12/3/2014		2/10/2015		5/12/2015		11/19/2015		5/19/2016		11/29/2017		5/3/2018		10/25/2018		5/3/2019		6/3/2013	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		24.65 - 24.7		24.25 - 24.25		24.94 - 25.19		21.72 - 21.95		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																								1320	
Nitrate	mg/L	10																							< 20	U
Nitrite	mg/L	1																							< 20	U
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																								1	U
FIELD TESTS																										
Conductivity	µS/cm																3.8		3.56		3.80		3.70		4.85	
Dissolved oxygen	mg/L																8.55		8.73		0.1		0.07		0	
Oxidation-Reduction Potential	mV																264		88		200		249		74	
pH	SU																4.72		6.68		5.01		5.05		6.62	
Temperature	C																17.74		19.86		17.79		20.26		29.25	
Turbidity	NTU																3.2		13.3		65.6		31.4		7.6	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																								< 1	U
Ethylene	µg/L																								1.29	J
Methane	µg/L																								10.6	
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																								0.0795	
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																								3.61	
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000															< 1	U	< 0.5	U	< 0.5	U	< 0.5	U		
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
1,1-Dichloroethane	µg/L	10,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	53.2	
1,1-Dichloroethene	µg/L	7	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	1390	J
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U	< 0.15	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	12.5	R
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U	25	R
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	3.13	R
1,2-Dichloroethane	µg/L	5	1.44		1.39		1.19		1.04		0.817	J	0.601	J	0.33	J	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	64.3	R
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	5	R
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	3.13	R
2,2-Dichloropropane	µg/L	42	0.5	UJ	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	62.5	R
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW07																						67WW08	
		Sample ID	67WW07-050614		67WW07-072514		67WW07-120314		67WW07-021015		67WW07-051215		67WW07-111915		67WW07-051916		67WW07-112917		67WW07-180503		67WW07-181025		67WW07-190503		67WW08-060313	
		Sample Date	5/6/2014		7/25/2014		12/3/2014		2/10/2015		5/12/2015		11/19/2015		5/19/2016		11/29/2017		5/3/2018		10/25/2018		5/3/2019		6/3/2013	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		24.65 - 24.7		24.25 - 24.25		24.94 - 25.19		21.72 - 21.95		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 5	U	< 5	U	< 5	U	3.18	J	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2.5	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 2	U	< 5.1	U	< 2.5	U
Benzene	µg/L	5	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	3.13	R
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	3.13	R
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 1	U	1	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	0.5	UJ
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
Chlorobenzene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	3.13	R
Chloromethane	µg/L	220	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	2.18	
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U	< 1	U	6.25	R
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	62.5	R
Methylene chloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2	U	< 1	U	< 1	U	< 1	U	6.25	R
Naphthalene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U	5	R
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	3.13	R
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R
Styrene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	2.86	
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	6.25	R

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW08																							
		Sample ID	67WW08-100213		67WW08-012314		67WW08-050714		67WW08-072414		67WW08-120414		67WW08-021115		67WW08-051915		67WW08-111915		67WW08-051916		67WW08-112817-FD		67WW08-112817		67WW08-180501	
		Sample Date	10/2/2013		1/23/2014		5/7/2014		7/24/2014		12/4/2014		2/11/2015		5/19/2015		11/19/2015		5/19/2016		11/28/2017		11/28/2017		5/1/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		24 - 24.17		24 - 24.17		22.99 - 23.12	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		FD		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L		1360		1490		1380		1340		1410	H1	1250		1750		1400		1510		1590		1600		1530	
Nitrate	mg/L	10	< 2	U	< 2	U	< 2	U	< 1	U	2	U	< 4	U	< 2	U	< 2	U	< 2	U	< 0.1	U	< 0.1	U	< 0.1	U
Nitrite	mg/L	1	< 2	U	< 2	U	< 2	U	< 1	U	2.04	J	< 4	U	3.95	J	< 2	U	< 2	U	< 0.1	U	< 0.1	U	< 0.1	U
DHC																										
BVC	CEQ/mL		< 0.5	U	< 0.5	U	< 0.5	U																		
Dehalococcoides	cells/mL		0.5	U	< 0.5	U	0.6														< 0.5	U	< 0.5	U	0.2	
FIELD TESTS																										
Conductivity	µS/cm		5.11		5.08		5.43		4.98		5.07		4.38		5.85		5.06		5.42				5.83		5.61	
Dissolved oxygen	mg/L		0.74		0.38		0.45		0		0		0		0.66		0.44		0.82				0.26		0	
Oxidation-Reduction Potential	mV		-165		-90		-32		-7		-1		45		-16		113		129				186		250	
pH	SU		6.47		6.8		5.55		6.89		6.42		6.61		6.53		6.13		5.79				5.88		6.68	
Temperature	C		21.82		17.22		19.33		21.72		19.14		18.75		20.12		19.15		18.74				19.04		22.03	
Turbidity	NTU		1.5		0.6		9.7		6.1		2.7		3.7		67.1		45.3		9.3				21.3		6.5	
GASES																										
Carbon dioxide	µg/L										89600										240000		290000		420000	
Ethane	µg/L		< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 0.23	U	< 0.23	U	< 0.47	U
Ethylene	µg/L		< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 0.22	U	< 0.22	U	< 0.55	UJ
Methane	µg/L		< 9.49		7.79		6.97		6.47		14.4		9.4		5.16		12.1		11.3		1.6	J	2	J	2.1	
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L		161		0.344		282		227		0.374		0.0907		0.944		93.1		58.5						0.063	J
SULFIDE																										
Sulfide	mg/L		< 1	U	< 1	U	< 1	U					< 1	U	< 1	U	< 1	U	< 1	U	1.48	J	1.48	J	< 1.5	U
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																				140		130		150	
Total organic carbon	mg/L		6.32		9.95		10.6		7.58		3.68		22.4		8.32		47.5		65.4		4		3.99		4.14	
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 4	U	< 2	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 1	U	< 1	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000																			< 1	U	< 1	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	5.08	J	6.7		5.01	J	7.74	J	7.36	J	6.96	J	4.5	J	4.67	J	2.76	J	< 1	U	< 1	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	46.5		54.4		57.3		56.7		63.9		61.1		52.1		48.1		31.9		18		15		14	
1,1-Dichloroethene	µg/L	7	1120		1340		1590		1890		2320		1930		1570		1710		1130		350		340		300	
1,1-Dichloropropene	µg/L	2.9	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 3	U	< 1.5	U	< 3	U	< 3	U	< 3	U	< 3	U	< 3	U	< 3	U	< 3	U	< 1	U	< 1	U	< 0.5	U
1,2,3-Trichloropropane	µg/L	0.041	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 1	U	< 1	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 4	U	< 2	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 1	U	< 1	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 20	U	< 10	U	< 20	U	< 20	U	< 20	U	< 20	U	< 20	U	< 20	U	< 20	U	< 1	U	< 1	U	< 0.5	U
1,2-Dibromoethane	µg/L	0	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 2.5	U	< 1.25	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	76.5		89.9		101		98.9		106		104		85.6		77.6		56.1		13		13		11	
1,2-Dichloropropane	µg/L	5	< 4	U	< 2	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 1	U	< 1	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 4	U	< 2	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 1	U	< 1	U	< 0.5	U
1,4-Dichlorobenzene	µg/L	75	< 2.5	U	< 1.25	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U
2,2-Dichloropropane	µg/L	42	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
2-Butanone	µg/L	61,000	< 50	U	< 25	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 2	U	< 2	U	< 1	U
2-Chlorotoluene	µg/L	2,000	< 2.5	U	< 1.25	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW08																							
		Sample ID	67WW08-100213		67WW08-012314		67WW08-050714		67WW08-072414		67WW08-120414		67WW08-021115		67WW08-051915		67WW08-111915		67WW08-051916		67WW08-112817-FD		67WW08-112817		67WW08-180501	
		Sample Date	10/2/2013		1/23/2014		5/7/2014		7/24/2014		12/4/2014		2/11/2015		5/19/2015		11/19/2015		5/19/2016		11/28/2017		11/28/2017		5/1/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		24 - 24.17		24 - 24.17		22.99 - 23.12	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		FD		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 50	U	< 25	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 2	U	< 2	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Acetone	µg/L	92,000	< 50	U	< 25	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 2	U	< 2	U	< 1	U
Benzene	µg/L	5	< 2.5	U	< 1.25	U	< 3.37	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U
Bromobenzene	µg/L	2,000	< 2.5	U	< 1.25	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U
Bromochloromethane	µg/L	4,100	< 4	U	< 2	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 1	U	< 1	U	< 0.5	U
Bromodichloromethane	µg/L	4.6	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Bromoform	µg/L	36	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 1	U	< 1	U	< 0.5	U
Bromomethane	µg/L	140	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 1	U	< 1	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 2	U	< 2	U	< 1	U
Carbon tetrachloride	µg/L	5	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Chlorobenzene	µg/L	100	< 2.5	U	< 1.25	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U
Chloroethane	µg/L	41,000	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 1	U	< 1	U	< 0.5	U
Chloroform	µg/L	1,000	2.66	UJ	4.11	J	4.88	J	5.13	J	2.53	J	2.57	J	3.04	J	1.61	J	< 2.5	U	< 1	U	< 1	U	< 0.5	U
Chloromethane	µg/L	220	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 1	U	< 1	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 5	U	2.73	J	< 5	U	< 5	U	2.69	J	2.71	J	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Dibromomethane	µg/L	380	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Ethylbenzene	µg/L	700	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	< 1	U	< 1	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 2	U	< 2	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 50	U	< 25	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 50	U	< 2	U	< 2	U	< 1	U
Methylene chloride	µg/L	5	< 5	U	< 2.5	U	< 5	U	< 5	U	3.42	J	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 2	U	< 1	U
Naphthalene	µg/L	2,000	< 4	U	< 2	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 4	U	< 1	U	< 1	U	< 0.5	U
n-Butylbenzene	µg/L	4,100	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 2.5	U	< 1.25	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U
o-Xylene	µg/L	10,000	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Styrene	µg/L	100	< 2.5	U	< 1.25	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 2.5	U	< 1	U	< 1	U	< 0.5	U
tert-Butylbenzene	µg/L	4,100	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Toluene	µg/L	1,000	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 10	U	< 5	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	< 1	U	< 1	U	< 0.5	U
Trichloroethene	µg/L	5	< 5	U	3.12	J	4.41	J	3.14	J	3.55	J	3.15	J	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U
Vinyl chloride	µg/L	2	< 5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 1	U	< 1	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW08						67WW09																	
		Sample ID	67WW08-181023		67WW08-181023-FD		67WW08-190501		67WW10-060113		67WW09-060113		67WW09-092813		67WW09-012414		67WW09-072514		67WW09-120414		67WW09-021115		67WW09FD-021115		67WW09-051915	
		Sample Date	10/23/2018		10/23/2018		5/1/2019		6/1/2013		6/3/2013		9/28/2013		1/24/2014		7/25/2014		12/4/2014		2/11/2015		2/11/2015		5/19/2015	
		Depth	24.41 - 24.62		24.41 - 24.62		21.67 - 21.9		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		FD		REG		REG		REG		REG		REG		REG		REG		REG		FD		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L		1820		1770		1680																			
Nitrate	mg/L	10	< 0.2	U	< 0.2	U	< 0.5	U																		
Nitrite	mg/L	1	< 0.2	U	< 0.2	U																				
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL		9.3																							
FIELD TESTS																										
Conductivity	µS/cm		6.29				6.28		3.31				3.47		3.39		3.42		3.55		3.29				3.35	
Dissolved oxygen	mg/L		0.08				0.08		0.52				0.83		0.86		0.61		0		1.02				1.13	
Oxidation-Reduction Potential	mV		150				138		189				157		136		310		166		164				259	
pH	SU		6.33				5.82		6.64				6.31		6.24		5.41		5.95		6.45				5.48	
Temperature	C		18.14				20.44		27.95				22.22		16.27		26.09		20.48		18.13				18.88	
Turbidity	NTU		0				0		4.5				1.7		0.9		4.4		1.8		3.4				12.5	
GASES																										
Carbon dioxide	µg/L		130000		130000		270000																			
Ethane	µg/L		< 0.94	U	< 0.94	U	< 0.47	U																		
Ethylene	µg/L		< 1.1	U	< 1.1	U	< 0.55	U																		
Methane	µg/L		5.4		5.5		2.5																			
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L		0.343		0.27																					
SULFIDE																										
Sulfide	mg/L		< 1	U	< 1	U																				
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L		55		58																					
Total organic carbon	mg/L		2.86		3.19		2.09																			
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	0.25	UJ	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	0.2	UJ	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000	< 0.5	U	< 0.5	U	< 0.5	U																		
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	12		12		7.5		0.39	J	3.6		3.97		4.59		3.03		3.93		2.93		2.92		1.56	
1,1-Dichloroethene	µg/L	7	160		160		110		< 0.5	U	16.1		17.5		20.8		8.93		11.6		8.17		8.29		2.71	
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5	U	< 0.5	U	< 0.5	U	< 0.15	U	< 0.15	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 1	U	< 1	U	< 0.5	U	1	UJ	1	UJ	< 2	U	2	UJ	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
1,2-Dichloroethane	µg/L	5	6.5		6.2		5.1		< 0.25	U	< 0.25	U	0.414	J	0.347	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,4-Dichlorobenzene	µg/L	75	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
2-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	0.25	UJ

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW08						67WW09																	
		Sample ID	67WW08-181023		67WW08-181023-FD		67WW08-190501		67WW10-060113		67WW09-060113		67WW09-092813		67WW09-012414		67WW09-072514		67WW09-120414		67WW09-021115		67WW09FD-021115		67WW09-051915	
		Sample Date	10/23/2018		10/23/2018		5/1/2019		6/1/2013		6/3/2013		9/28/2013		1/24/2014		7/25/2014		12/4/2014		2/11/2015		2/11/2015		5/19/2015	
		Depth	24.41 - 24.62		24.41 - 24.62		21.67 - 21.9		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		FD		REG		REG		REG		REG		REG		REG		REG		REG		FD		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 2	U	< 2	U	< 1	U	< 2.5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
Benzene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromobenzene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromochloromethane	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Bromomethane	µg/L	140	< 0.5	U	< 0.5	U	< 0.5	U	0.5	UJ	0.5	UJ	< 1	U	< 1	U	< 1	U	< 1	U	1	UJ	1	UJ	< 1	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloroethane	µg/L	41,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Chloroform	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloromethane	µg/L	220	< 0.5	U	< 0.5	U	< 0.5	U	0.5	UJ	0.5	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	UJ	< 0.5	UJ	< 0.5	U	0.25	UJ	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 1	U	< 1	U	< 1	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 1	U	< 1	U	< 1	U	< 2.5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
Methylene chloride	µg/L	5	< 1	U	< 1	U	< 1	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Naphthalene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	0.472	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW09																67WW09A							
		Sample ID	67WW09-111815		67WW09FD-111815		67WW09-051816		67WW09FD-051816		67WW09-112717		67WW09-180502		67WW09-181023		67WW09-190503		67WW09A-092713-		67WW09A-092713		67WW09A-012314		67WW09A-050614	
		Sample Date	11/18/2015		11/18/2015		5/18/2016		5/18/2016		11/27/2017		5/2/2018		10/23/2018		5/3/2019		9/27/2013		9/27/2013		1/23/2014		5/6/2014	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		22.06 - 22.29		21.02 - 21.21		22.43 - 22.65		19.83 - 20.06		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		FD		REG		FD		REG		REG		REG		REG		FD		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		3.98				3.95				3.65		3.48		3.35		3.49				2.45		2.49		2.53	
Dissolved oxygen	mg/L		0				0.6				0.09		0.2		0.1		0.13				1.19		0.59		0.46	
Oxidation-Reduction Potential	mV		224				305				325		412		203		250				182		18		20	
pH	SU		5.63				5.19				5.27		5.70		6.23		5.36				5.62		6.73		5.55	
Temperature	C		19.88				18.25				19.97		19.4		18.75		20.04				28.67		15.63		19.01	
Turbidity	NTU		0				0.8				31.4		4.3		0		0				21.5		32.1		20.7	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000									< 1	U	< 0.5	U	< 0.5	U	< 0.5	U								
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	1.08		1.08		0.477	J	0.487	J	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
1,1-Dichloroethene	µg/L	7	1.66	J	1.62	J	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 2	U	< 2	U	< 2	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U	< 2	U	< 2	U	2	UJ	< 2	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U	< 5	U	< 5	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW09																67WW09A							
		Sample ID	67WW09-111815		67WW09FD-111815		67WW09-051816		67WW09FD-051816		67WW09-112717		67WW09-180502		67WW09-181023		67WW09-190503		67WW09A-092713-		67WW09A-092713		67WW09A-012314		67WW09A-050614	
		Sample Date	11/18/2015		11/18/2015		5/18/2016		5/18/2016		11/27/2017		5/2/2018		10/23/2018		5/3/2019		9/27/2013		9/27/2013		1/23/2014		5/6/2014	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		22.06 - 22.29		21.02 - 21.21		22.43 - 22.65		19.83 - 20.06		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		FD		REG		FD		REG		REG		REG		REG		FD		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U	< 5	U	< 5	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 2	U	< 3.2	U	< 5	U	< 5	U	< 5	U	< 5	U
Benzene	µg/L	5	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 1	U	1	UJ	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U
Chloroform	µg/L	1,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloromethane	µg/L	220	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U	< 5	U	< 5	U
Methylene chloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Naphthalene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW09A																							
		Sample ID	67WW09AFD-072414		67WW09A-072414		67WW09AFD-120314		67WW09A-120314		67WW09A-021015		67WW09A-051215		67WW09A-111815		67WW09A-051816		67WW09A-112917		67WW09A-180503		67WW09A-181025		67WW09A-190502	
		Sample Date	7/24/2014		7/24/2014		12/3/2014		12/3/2014		2/10/2015		5/12/2015		11/18/2015		5/18/2016		11/29/2017		5/3/2018		10/25/2018		5/2/2019	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		26.81 - 27		25.85 - 26.01		27.02 - 27.26		24.35 - 24.58	
		Sample Purpose	FD		REG		FD		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm				2.36				2.31		2.25		2.02		2.35		2.48		2.87		2.88		3.26		3.42	
Dissolved oxygen	mg/L				0.12				0		0		0.47		0		0.42		0.16		0.29		0.05		0.09	
Oxidation-Reduction Potential	mV				26				30		-12		112		127		137		128		244		138		123	
pH	SU				6.89				6.5		7.13		5.67		5.81		5.64		5.94		5.74		6.04		6.0	
Temperature	C				24.26				18.75		17.83		18.84		18.3		18.55		19.55		20.3		17.79		20.8	
Turbidity	NTU				5.8				4.3		20.8		31.3		12		0		0		6.9		0		24	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000																	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW09A																							
		Sample ID	67WW09AFD-072414		67WW09A-072414		67WW09AFD-120314		67WW09A-120314		67WW09A-021015		67WW09A-051215		67WW09A-111815		67WW09A-051816		67WW09A-112917		67WW09A-180503		67WW09A-181025		67WW09A-190502	
		Sample Date	7/24/2014		7/24/2014		12/3/2014		12/3/2014		2/10/2015		5/12/2015		11/18/2015		5/18/2016		11/29/2017		5/3/2018		10/25/2018		5/2/2019	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		26.81 - 27		25.85 - 26.01		27.02 - 27.26		24.35 - 24.58	
		Sample Purpose	FD		REG		FD		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 2	U	< 5	U
Benzene	µg/L	5	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloromethane	µg/L	220	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U	< 1	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U
Methylene chloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2	U	< 1	U	< 1	U	< 1	U
Naphthalene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW10																					
		Sample ID	67WW10-092713		67WW10-012414		67WW10-050614		67WW10-072414		67WW10-120314		67WW10-021015		67WW10-051215		67WW10-111815		67WW10-051816		67WW10-112917		67WW10-180503		67WW10-181022	
		Sample Date	9/27/2013		1/24/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		11/18/2015		5/18/2016		11/29/2017		5/3/2018		10/22/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		25.35 - 25.6		23.83 - 23.93		25.65 - 25.88	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		6.23		6.45		6.02		6.13		6.09		5.84		5.65		5.95		6.36		5.12		5.44		5.17	
Dissolved oxygen	mg/L		0.6		0.54		0.44		0.52		0		0		0.64		0.1		0.5		0.32		1.16		0.18	
Oxidation-Reduction Potential	mV		-9		29		55		174		83		25		117		68		163		221		192		178	
pH	SU		6.02		6.07		5.29		5.59		5.56		6.18		5.53		5.77		5.02		5.01		4.97		5.51	
Temperature	C		25.2		15.1		20.2		22.24		19.2		17.33		18.78		17.68		18.66		19.32		20.94		18.54	
Turbidity	NTU		1.6		0.4		2.6		54.7		9.1		0		217		90.8		30.9		42		22.3		31.2	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000																			< 1	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	0.362	J	0.319	J	< 0.25	U	< 0.25	U	0.173	J	< 0.25	U	< 0.25	U	0.14	J	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 1	U	< 0.5	U	< 0.5	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	2	UJ	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 1	U	< 0.5	U	< 1	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW10																							
		Sample ID	67WW10-092713		67WW10-012414		67WW10-050614		67WW10-072414		67WW10-120314		67WW10-021015		67WW10-051215		67WW10-111815		67WW10-051816		67WW10-112917		67WW10-180503		67WW10-181022	
		Sample Date	9/27/2013		1/24/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		11/18/2015		5/18/2016		11/29/2017		5/3/2018		10/22/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		25.35 - 25.6		23.83 - 23.93		25.65 - 25.88	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 2	U
Benzene	µg/L	5	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	1	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
Chloromethane	µg/L	220	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	UJ
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U	< 1	U
Methylene chloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2	U	< 1	U	< 1	U
Naphthalene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW10		67WW11																					
		Sample ID	67WW10-190502		67WW11-060113		67WW11-060113-FD		67WW11-100213		67WW11 FD-012314		67WW11FD-012314		67WW11-012314		67WW11-072414		67WW11-120414		67WW11-021115		67WW11-051915		67WW11-111915	
		Sample Date	5/2/2019		6/1/2013		6/1/2013		10/2/2013		1/23/2014		1/23/2014		1/23/2014		7/24/2014		12/4/2014		2/11/2015		5/19/2015		11/19/2015	
		Depth	22.31 - 22.53		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		FD		REG		FD		FD		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																		1330	J	1350				1380	
Nitrate	mg/L	10							< 2	U							< 1	U	2	J	< 2	U			< 2	U
Nitrite	mg/L	1							< 2	U							< 1	U	1.97	J	< 2	U			< 2	U
DHC																										
BVC	CEQ/mL								< 0.5	U																
Dehalococcoides	cells/mL								< 0.5	U																
FIELD TESTS																										
Conductivity	µS/cm		5.8		4.27				4.74						4.77		4.85		5.17		4.8		4.47		4.89	
Dissolved oxygen	mg/L		0.06		1.17				0.63						0.48		1.07		0		0		0.69		0.18	
Oxidation-Reduction Potential	mV		157		168				64						129		194		204		165		246		183	
pH	SU		5.37		6.78				6.23						5.84		6.72		5.63		6.04		5.49		5.61	
Temperature	C		20.46		23.9				22.65						17.25		22		19.1		18.42		19.2		18.49	
Turbidity	NTU		25.4		9.6				4						1.9		2.9		5.6		4.7		105		25.9	
GASES																										
Carbon dioxide	µg/L																		364000							
Ethane	µg/L								< 2	U							< 2	U	< 2	U	< 2	U			< 2	U
Ethylene	µg/L								< 2	U							< 2	U	< 2	U	< 2	U			< 2	U
Methane	µg/L								< 4.38	J							< 2	U	2.41	J	1.78	J			2.11	J
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L								< 40	U							< 0.04	U	< 40	U	< 0.04	U			< 0.04	U
SULFIDE																										
Sulfide	mg/L								< 1	U											< 1	U			< 1	U
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L								5.7								8.7		9.1	J	12.9				23.1	
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5	U	0.2	UJ	0.2	UJ	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000	< 0.5	U																						
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	< 0.5	U	10.6		10.6		10.6		10.7		10.7		9.83		10.4		11.1		9.81		8.25		8.54	
1,1-Dichloroethene	µg/L	7	< 0.5	U	47.1		46.8		42.8		43		43		38.8		34.5		37.5		30.4		21.6		28.5	
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5	U	< 0.15	U	< 0.15	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 0.5	U	1	UJ	1	UJ	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	0.869	J	0.85	J	0.799	J	0.823	J	0.823	J	0.748	J	0.684	J	0.567	J	0.559	J	0.518	J	0.513	J
1,2-Dichloropropane	µg/L	5	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,4-Dichlorobenzene	µg/L	75	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 1	U	< 2.5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
2-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	0.25	UJ	< 0.25	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW10		67WW11																					
		Sample ID	67WW10-190502		67WW11-060113		67WW11-060113-FD		67WW11-100213		67WW11 FD-012314		67WW11FD-012314		67WW11-012314		67WW11-072414		67WW11-120414		67WW11-021115		67WW11-051915		67WW11-111915	
		Sample Date	5/2/2019		6/1/2013		6/1/2013		10/2/2013		1/23/2014		1/23/2014		1/23/2014		7/24/2014		12/4/2014		2/11/2015		5/19/2015		11/19/2015	
		Depth	22.31 - 22.53		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		FD		REG		FD		FD		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 1	U	< 2.5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 7.8	U	< 2.5	U	< 2.5	U	33.6		< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
Benzene	µg/L	5	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromobenzene	µg/L	2,000	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromochloromethane	µg/L	4,100	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Bromomethane	µg/L	140	< 0.5	U	0.5	UJ	0.5	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	1	UJ	< 1	U	< 1	U
Carbon disulfide	µg/L	10,000	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloroethane	µg/L	41,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Chloroform	µg/L	1,000	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloromethane	µg/L	220	< 0.5	U	< 0.5	U	< 0.5	U	0.536	J	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 1	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 1	U	< 2.5	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
Methylene chloride	µg/L	5	< 1	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Naphthalene	µg/L	2,000	< 0.5	U	< 0.2	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.5	U	< 0.125	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.25	U	< 0.25	U	< 0.5	U	0.296	J	0.296	J	< 0.5	U	0.271	J	0.302	J	< 0.5	U	< 0.5	U	0.333	J

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW11										67WW12													
		Sample ID	67WW11-051916		67WW11-112717		67WW11-180502		67WW11-181023		67WW11-190501		67WW12-060113		67WW12-100113		67WW12-012414		67WW12-050614		67WW12-072514		67WW12-120314		67WW12-021015	
		Sample Date	5/19/2016		11/27/2017		5/2/2018		10/23/2018		5/1/2019		6/1/2013		10/1/2013		1/24/2014		5/6/2014		7/25/2014		12/3/2014		2/10/2015	
		Depth	0 - 0		23.53 - 23.77		22.43 - 22.59		23.95 - 24.2		21.21 - 21.44		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L		1430																							
Nitrate	mg/L	10	< 2	U																						
Nitrite	mg/L	1	< 2	U																						
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		5.19		5.15		4.96		4.99		4.65		4.4		4.54		4.12		4.56		4.52		5.21		3.37	
Dissolved oxygen	mg/L		0.74		0.19		0.94		0.07		0.5		0.57		0.66		0.62		0.8		0.21		0		0.17	
Oxidation-Reduction Potential	mV		169		291		431		171		195		175		-119		91		43		12		20		139	
pH	SU		5.87		5.87		5.88		6.45		5.29		6.71		6.31		6.22		5.39		6.36		6.06		5.32	
Temperature	C		18.29		19.49		19.8		18.02		20.6		27.34		22.99		15.69		20.51		22.61		19.09		19.7	
Turbidity	NTU		1.2		20.7		8.5		1.9		7.8		2.7		0.3		0		5.2		10.8		0.5		2.1	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L		< 2	U																						
Ethylene	µg/L		< 2	U																						
Methane	µg/L		< 2	U																						
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L		< 0.04	U																						
SULFIDE																										
Sulfide	mg/L		< 1	U																						
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L		22.1																							
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	0.2	UJ	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000			< 1	U	< 0.5	U	< 0.5	U	< 0.5	U														
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	6.58		3.6		3.3		3.8		1.9	J	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
1,1-Dichloroethene	µg/L	7	19.3		5.2		5.5		6.1		2.8		< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.15	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U	1	UJ	2	UJ	2	UJ	< 2	U	< 2	U	< 2	U	< 2	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
1,2-Dichloroethane	µg/L	5	0.396	J	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW11										67WW12													
		Sample ID	67WW11-051916		67WW11-112717		67WW11-180502		67WW11-181023		67WW11-190501		67WW12-060113		67WW12-100113		67WW12-012414		67WW12-050614		67WW12-072514		67WW12-120314		67WW12-021015	
		Sample Date	5/19/2016		11/27/2017		5/2/2018		10/23/2018		5/1/2019		6/1/2013		10/1/2013		1/24/2014		5/6/2014		7/25/2014		12/3/2014		2/10/2015	
		Depth	0 - 0		23.53 - 23.77		22.43 - 22.59		23.95 - 24.2		21.21 - 21.44		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 5	U	< 2	U	< 1	U	< 2	U	5.6		< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
Benzene	µg/L	5	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.161	B	< 0.25	U	< 0.25	U	< 0.25	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	UJ	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	0.5	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon disulfide	µg/L	10,000	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Chloroform	µg/L	1,000	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	UJ	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
Chloromethane	µg/L	220	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	UJ	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	0.5	UJ	< 1	U	< 0.5	U	< 1	U	< 1	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2.5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U
Methylene chloride	µg/L	5	< 0.5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Naphthalene	µg/L	2,000	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.2	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
o-Xylene	µg/L	10,000	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	0.299	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.125	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Trichloroethene	µg/L	5	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW12																							
		Sample ID	67WW12-051215		67WW12FFD-111815		67WW12-111815		67WW12-161215		67WW12-161215		67WW12-161215DUP		67WW12-051816		67WW12-112917-FD		67WW12-112917		67WW12-180503		67WW12-181022		67WW12-190502	
		Sample Date	5/12/2015		11/18/2015		11/18/2015		12/16/2015		12/16/2015		12/16/2015		5/18/2016		11/29/2017		11/29/2017		5/3/2018		10/22/2018		5/2/2019	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		26.03 - 26.26		26.03 - 26.26		24.92 - 25.03		26.3 - 26.55		23.85 - 24.05	
		Sample Purpose	REG		FD		REG		REG		REG		FD		REG		FD		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		3.34				3.69				4.66				4.06				5.17		4.14		5.24		3.56	
Dissolved oxygen	mg/L		1.23				0.05				0				0.36				0.43		0		0.29		0.61	
Oxidation-Reduction Potential	mV		54				178				50				221				209		295		209		187	
pH	SU		5.41				5.21				5.85				4.96				5.52		5.33		5.68		5.35	
Temperature	C		18.55				17.95				19.38				18.41				19.71		20.76		18.77		20.12	
Turbidity	NTU		0				3.1				11				5.7				0		0		0		6.3	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U							< 0.4	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000															< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	< 0.25	U	< 0.25	U	< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	< 1	U	< 1	U	< 1	U							0.681	J	1.8		2.2		< 0.5	U	4.8		2.1	
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U							< 0.3	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U							< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U							< 0.4	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 2	U	< 2	U							< 2	U	< 1	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U							< 0.4	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U							< 0.4	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U							< 5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 1	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW12																							
		Sample ID	67WW12-051215		67WW12FFD-111815		67WW12-111815		67WW12-161215		67WW12-161215		67WW12-161215DUP		67WW12-051816		67WW12-112917-FD		67WW12-112917		67WW12-180503		67WW12-181022		67WW12-190502	
		Sample Date	5/12/2015		11/18/2015		11/18/2015		12/16/2015		12/16/2015		12/16/2015		5/18/2016		11/29/2017		11/29/2017		5/3/2018		10/22/2018		5/2/2019	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		26.03 - 26.26		26.03 - 26.26		24.92 - 25.03		26.3 - 26.55		23.85 - 24.05	
		Sample Purpose	REG		FD		REG		REG		REG		FD		REG		FD		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	5	UJ	< 5	U	< 5	U							< 5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U							< 5	U	< 2	U	< 2	U	< 1	U	< 2	U	< 1	U
Benzene	µg/L	5	< 0.25	U	< 0.25	U	< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U							< 0.4	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U							< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 1	U							1	UJ	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 1	U			< 1	U							< 1	U	< 2	U	< 2	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.25	U			< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloroethane	µg/L	41,000	< 1	U			< 1	U							< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.25	U			< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloromethane	µg/L	220	< 1	U			< 1	U							< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 1	U	< 1	U
Isopropylbenzene	µg/L	10,000	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U			< 1	U							< 1	U	< 2	U	< 2	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U							< 5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 1	U
Methylene chloride	µg/L	5	< 0.5	U			< 0.5	U							< 0.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 1	U
Naphthalene	µg/L	2,000	< 0.4	U			< 0.4	U							< 0.4	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Butylbenzene	µg/L	4,100	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.25	U			< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
o-Xylene	µg/L	10,000	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.25	U			< 0.25	U							< 0.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U			< 1	U							< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U			< 0.5	U							< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW13																							
		Sample ID	67WW13-053113		67WW13-100113		67WW13-012414		67WW13FD-012414		67WW13FD-050614		67WW13-050614		67WW13FD-072514		67WW13-072514		67WW13FD-120414		67WW13-120414		67WW13-021115		67WW13-032515	
		Sample Date	5/31/2013		10/1/2013		1/24/2014		1/24/2014		5/6/2014		5/6/2014		7/25/2014		7/25/2014		12/4/2014		12/4/2014		2/11/2015		3/25/2015	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		FD		FD		REG		FD		REG		FD		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																								1820	
Nitrate	mg/L	10																							< 2	U
Nitrite	mg/L	1																							< 2	U
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		5.55		6.65		6.87						6.16				6.83				6.81		6.08		6.54	
Dissolved oxygen	mg/L		1.17		0.98		0.16						2.03				1.19				0.29		1.73		1.55	
Oxidation-Reduction Potential	mV		106		37		125						122				178				150		145		176	
pH	SU		6.68		7.09		6.76						5.86				6.24				6.46		7.16		4.62	
Temperature	C		34.55		21.97		15.8						25.17				25.2				19.85		16.69		20.67	
Turbidity	NTU		0.2		0.3		0						1.2				0.2				0		0.2		0	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																								< 2	U
Ethylene	µg/L																								< 2	U
Methane	µg/L																								< 2	U
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																								< 40	U
SULFIDE																										
Sulfide	mg/L																								< 1	U
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																								16.8	J
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
1,1,1-Trichloroethane	µg/L	200	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.2	U	< 0.4	U	< 1	U	< 1	U	< 0.8	U	< 0.8	U	< 0.4	U	< 0.4	U	< 2	U	< 2	U	< 1	U		
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000																								
1,1,2-Trichloroethane	µg/L	5	3.58		3.37		2.99		3.01		1.95	J	1.99	J	3.56		3.48		4.56	J	4.4	J	4.87			
1,1-Dichloroethane	µg/L	10,000	35.5		33.8		32.7		32.4		14.4		15.5		22.1		21.9		27.4		28.8		29.1			
1,1-Dichloroethene	µg/L	7	498		515		572		569		228		240		362		353		522		572		521			
1,1-Dichloropropene	µg/L	2.9	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
1,2,3-Trichlorobenzene	µg/L	310	< 1.5	U	< 0.3	U	< 0.75	U	< 0.75	U	< 0.6	U	< 0.6	U	< 0.3	U	< 0.3	U	< 1.5	U	< 1.5	U	< 0.75	U		
1,2,3-Trichloropropane	µg/L	0.041	< 5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
1,2,4-Trichlorobenzene	µg/L	70	< 0.2	U	< 0.4	U	< 1	U	< 1	U	< 0.8	U	< 0.8	U	< 0.4	U	< 0.4	U	< 2	U	< 2	U	< 1	U		
1,2,4-Trimethylbenzene	µg/L	5,100	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
1,2-Dibromo-3-chloropropane	µg/L	0	< 10	U	2	UJ	< 5	U	5	UJ	< 4	U	< 4	U	< 2	U	< 2	U	< 10	U	< 10	U	< 5	U		
1,2-Dibromoethane	µg/L	0	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
1,2-Dichlorobenzene	µg/L	600	< 0.125	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		
1,2-Dichloroethane	µg/L	5	23.1		23.8		22.9		22.9		12.9		13.7		20.1		19.8		24.6		24.9		26			
1,2-Dichloropropane	µg/L	5	< 2	U	< 0.4	U	< 1	U	< 1	U	< 0.8	U	< 0.8	U	< 0.4	U	< 0.4	U	< 2	U	< 2	U	< 1	U		
1,3,5-Trimethylbenzene	µg/L	5,100	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
1,3-Dichlorobenzene	µg/L	3,100	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
1,3-Dichloropropane	µg/L	29	< 2	U	< 0.4	U	< 1	U	< 1	U	< 0.8	U	< 0.8	U	< 0.4	U	< 0.4	U	< 2	U	< 2	U	< 1	U		
1,4-Dichlorobenzene	µg/L	75	< 1.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		
2,2-Dichloropropane	µg/L	42	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	1	UJ	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
2-Butanone	µg/L	61,000	< 2.5	U	< 5	U	< 12.5	U	< 12.5	U	< 10	U	< 10	U	< 5	U	< 5	U	< 25	U	< 25	U	< 12.5	U		
2-Chlorotoluene	µg/L	2,000	< 0.125	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW13																							
		Sample ID	67WW13-053113		67WW13-100113		67WW13-012414		67WW13FD-012414		67WW13FD-050614		67WW13-050614		67WW13FD-072514		67WW13-072514		67WW13FD-120414		67WW13-120414		67WW13-021115		67WW13-032515	
		Sample Date	5/31/2013		10/1/2013		1/24/2014		1/24/2014		5/6/2014		5/6/2014		7/25/2014		7/25/2014		12/4/2014		12/4/2014		2/11/2015		3/25/2015	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		FD		FD		REG		FD		REG		FD		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 25	U	< 5	U	< 12.5	U	< 12.5	U	< 10	U	< 10	U	< 5	U	< 5	U	< 25	U	< 25	U	< 12.5	U		
4-Chlorotoluene	µg/L	2,000	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Acetone	µg/L	92,000	< 25	U	< 5	U	< 12.5	U	< 12.5	U	< 10	U	< 10	U	< 5	U	< 5	U	< 25	U	< 25	U	< 12.5	U		
Benzene	µg/L	5	< 0.125	U	< 0.25	U	< 0.626	U	< 0.626	U	0.79	J	1.21	J	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		
Bromobenzene	µg/L	2,000	< 0.125	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		
Bromochloromethane	µg/L	4,100	< 0.2	U	< 0.4	U	< 1	U	< 1	U	< 0.8	U	< 0.8	U	< 0.4	U	< 0.4	U	< 2	U	< 2	U	< 1	U		
Bromodichloromethane	µg/L	4.6	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Bromoform	µg/L	36	< 0.5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
Bromomethane	µg/L	140	< 0.5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
Carbon disulfide	µg/L	10,000	< 0.5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
Carbon tetrachloride	µg/L	5	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Chlorobenzene	µg/L	100	< 1.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		
Chloroethane	µg/L	41,000	< 0.5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
Chloroform	µg/L	1,000	< 1.25	U	< 0.336	J	< 0.626	U	0.359	J	< 0.5	U	< 0.5	U	0.55	J	0.57	J	0.848	J	0.813	J	1.32	J		
Chloromethane	µg/L	220	< 5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
cis-1,2-Dichloroethene	µg/L	70	1.68		1.66		1.67	J	1.77	J	0.684	J	0.755	J	1.15		1.19		1.49	J	1.31	J	1.6	J		
cis-1,3-Dichloropropene	µg/L	5.3	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Dibromochloromethane	µg/L	34	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Dibromomethane	µg/L	380	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Dichlorodifluoromethane	µg/L	20,000	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Ethylbenzene	µg/L	700	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Hexachlorobutadiene	µg/L	20	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Isopropylbenzene	µg/L	10,000	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
m,p-Xylenes	µg/L	10,000	< 5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
Methyl isobutyl ketone	µg/L	8,200	< 2.5	U	< 5	U	< 12.5	U	< 12.5	U	< 10	U	< 10	U	< 5	U	< 5	U	< 25	U	< 25	U	< 12.5	U		
Methylene chloride	µg/L	5	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	2.9	J	2.88	J	< 1.25	U		
Naphthalene	µg/L	2,000	< 2	U	< 0.4	U	< 1	U	< 1	U	< 0.8	U	< 0.8	U	< 0.4	U	< 0.4	U	< 2	U	< 2	U	< 1	U		
n-Butylbenzene	µg/L	4,100	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
n-Propylbenzene	µg/L	4,100	< 1.25	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		
o-Xylene	µg/L	10,000	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
p-Isopropyltoluene	µg/L	10,000	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
sec-Butylbenzene	µg/L	4,100	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Styrene	µg/L	100	< 0.125	U	< 0.25	U	< 0.626	U	< 0.626	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U	< 1.25	U	< 1.25	U	< 0.626	U		
tert-Butylbenzene	µg/L	4,100	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Tetrachloroethene	µg/L	5	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Toluene	µg/L	1,000	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
trans-1,2-Dichloroethene	µg/L	100	< 0.25	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
trans-1,3-Dichloropropene	µg/L	29	< 0.5	U	< 1	U	< 2.5	U	< 2.5	U	< 2	U	< 2	U	< 1	U	< 1	U	< 5	U	< 5	U	< 2.5	U		
Trichloroethene	µg/L	5	2.71	J	2.81		2.86		2.99		1.27	J	1.25	J	1.71		1.72		1.94	J	1.65	J	2.63			
Trichlorofluoromethane	µg/L	31,000	< 2.5	U	< 0.5	U	< 1.25	U	< 1.25	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U	< 1.25	U		
Vinyl chloride	µg/L	2	2.55		2.1		2.37	J	2.37	J	0.619	J	0.644	J	0.728	J	0.707	J	< 2.5	U	< 2.5	U	0.653	J		

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW13																				67WW14			
		Sample ID	67WW13-051915		67WW13-111815		67WW13-161215		67WW13-051916		67WW13-112817		67WW13-180501		67WW13-180501FD		67WW13-181023		67WW13-190501-FD		67WW13-190501		67WW14-100113-FD		67WW14-100113	
		Sample Date	5/19/2015		11/18/2015		12/16/2015		5/19/2016		11/28/2017		5/1/2018		5/1/2018		10/23/2018		5/1/2019		5/1/2019		10/1/2013		10/1/2013	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		21.98 - 22.17		21.17 - 21.31		21.17 - 21.31		22.38 - 22.62		20.18 - 20.4		20.18 - 20.4		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		FD		REG		FD		REG		FD		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L		1680						1660		1570		1650		1520		1420		1300		1240					
Nitrate	mg/L	10	< 2	U					< 2	U	< 0.1	U	0.674		< 0.1	U	< 0.2	U	0.657		0.697					
Nitrite	mg/L	1	3.4	J					< 2	U	< 0.1	U	< 0.1	U	< 0.1	U	< 0.2	U								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL										0.3	NV	0.2				0.4	J								
FIELD TESTS																										
Conductivity	µS/cm		5.52		6.27		5.89		5.74		5.73		5.39				5.39				4.83				1.55	
Dissolved oxygen	mg/L		1.25		0.28		0		0.55		0.08		0.6				0.19				2.77				1.34	
Oxidation-Reduction Potential	mV		219		158		85		244		303		339				281				209				-60	
pH	SU		5.95		6.69		6.49		5.38		5.62		6.48				5.78				5.48				6.47	
Temperature	C		20.22		20.18		18.41		18.85		20.23		19.8				18.49				21.37				22.78	
Turbidity	NTU		0		0		1		0		1		1.5				0				0				3.6	
GASES																										
Carbon dioxide	µg/L										470000		870000		860000		620000		860000		840000					
Ethane	µg/L		< 2	U					< 2	U	< 0.23	U	< 0.47	U	< 0.47	U	< 0.47	U	< 0.47	U	< 0.47	U				
Ethylene	µg/L		< 2	U					< 2	U	< 0.22	U	< 0.55	U	< 0.55	U	< 0.55	U	< 0.55	U	< 0.55	U				
Methane	µg/L		< 2	U					< 2	U	0.32	J	< 1	U	< 1	U	< 0.85	U	< 1	U	< 1	U				
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L		< 0.04	U					< 40	U			< 0.04	UJ			35	J								
SULFIDE																										
Sulfide	mg/L		< 1	U					< 1	U	1.28		< 1.5	U	< 1.5	U	2.28									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L										320		340		350		130									
Total organic carbon	mg/L		62.4						93.3		3.4		3.07		3.18		3.99		3.24		2.91					
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 1	U	< 1	U			< 0.8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000									< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U				
1,1,2-Trichloroethane	µg/L	5	5.96		7.66				7		5.1		4.8		4.7		6.1		3.8		3.9		< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	30.2		46.3				22.5		19	J	15		15		32		13		14		0.304	J	0.197	J
1,1-Dichloroethene	µg/L	7	522		762				274		320		160		170		570		160		200		2.22		1.82	J
1,1-Dichloropropene	µg/L	2.9	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.75	U	< 0.75	U			< 0.6	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.3	U	< 0.3	U
1,2,3-Trichloropropane	µg/L	0.041	< 2.5	U	< 2.5	U			< 2	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U
1,2,4-Trichlorobenzene	µg/L	70	< 1	U	< 1	U			< 0.8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 5	U	< 5	U			< 4	U	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	2	UJ	2	UJ
1,2-Dibromoethane	µg/L	0	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
1,2-Dichloroethane	µg/L	5	30.6		42.6				35.7		32		27		28		43		23		24		0.849	J	0.692	J
1,2-Dichloropropane	µg/L	5	< 1	U	< 1	U			< 0.8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 1	U	< 1	U			< 0.8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U
1,4-Dichlorobenzene	µg/L	75	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
2,2-Dichloropropane	µg/L	42	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 12.5	U	< 12.5	U			< 10	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	7.47	J	9.06	J
2-Chlorotoluene	µg/L	2,000	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW13																				67WW14			
		Sample ID	67WW13-051915		67WW13-111815		67WW13-161215		67WW13-051916		67WW13-112817		67WW13-180501		67WW13-180501FD		67WW13-181023		67WW13-190501-FD		67WW13-190501		67WW14-100113-FD		67WW14-100113	
		Sample Date	5/19/2015		11/18/2015		12/16/2015		5/19/2016		11/28/2017		5/1/2018		5/1/2018		10/23/2018		5/1/2019		5/1/2019		10/1/2013		10/1/2013	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		21.98 - 22.17		21.17 - 21.31		21.17 - 21.31		22.38 - 22.62		20.18 - 20.4		20.18 - 20.4		0 - 0		0 - 0	
		Sample Purpose	REG		REG		REG		REG		REG		REG		FD		REG		FD		REG		FD		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 12.5	U	< 12.5	U			< 10	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U
4-Chlorotoluene	µg/L	2,000	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 12.5	U	< 12.5	U			< 10	U	< 2	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	2.59	J	3.27	J
Benzene	µg/L	5	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
Bromobenzene	µg/L	2,000	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
Bromochloromethane	µg/L	4,100	< 1	U	< 1	U			< 0.8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U
Bromodichloromethane	µg/L	4.6	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 2.5	U	< 2.5	U			< 2	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U
Bromomethane	µg/L	140	< 2.5	U	< 2.5	U			< 2	U	< 1	UJ	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U
Carbon disulfide	µg/L	10,000	< 2.5	U	< 2.5	U			< 2	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Carbon tetrachloride	µg/L	5	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
Chloroethane	µg/L	41,000	< 2.5	U	< 2.5	U			< 2	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U
Chloroform	µg/L	1,000	1.7	J	2.27	J			1.36	J	< 1	U	0.76	J	0.78	J	1.4		< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
Chloromethane	µg/L	220	< 2.5	U	< 2.5	U			< 2	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	0.64	J
cis-1,2-Dichloroethene	µg/L	70	2.08	J	2.75				1.55	J	< 1	U	0.99	J	1		1.9		0.81	J	0.94	J	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	UJ	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 1.25	U	< 1.25	U			1	UJ	< 1	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 2.5	U	< 2.5	U			< 2	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 12.5	U	< 12.5	U			< 10	U	< 2	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U
Methylene chloride	µg/L	5	< 1.25	U	< 1.25	U			< 1	U	< 2	UJ	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U
Naphthalene	µg/L	2,000	< 1	U	< 1	U			< 0.8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.4	U	< 0.4	U
n-Butylbenzene	µg/L	4,100	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
o-Xylene	µg/L	10,000	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	0.353	J	0.431	J
sec-Butylbenzene	µg/L	4,100	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.626	U	< 0.626	U			< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.25	U	< 0.25	U
tert-Butylbenzene	µg/L	4,100	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 1.25	U	< 1.25	U			< 1	U	< 1	UJ	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 2.5	U	< 2.5	U			< 2	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 1	U
Trichloroethene	µg/L	5	2.91		3.32				1.67	J	< 1	U	< 0.5	U	< 0.5	U	2.4		1		1.1		< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 1.25	U	< 1.25	U			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	0.695	J	1.65	J			< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW14																							
		Sample ID	67WW14-012414		67WW14-050714		67WW14-072514		67WW14-120314		67WW14-021015		67WW14FD-021015		67WW14FD-051215		67WW14-051215		67WW14-111815		67WW14-051816		67WW14-112717		67WW14-180502	
		Sample Date	1/24/2014		5/7/2014		7/25/2014		12/3/2014		2/10/2015		2/10/2015		5/12/2015		5/12/2015		11/18/2015		5/18/2016		11/27/2017		5/2/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		20.51 - 20.75		19.98 - 20.15	
		Sample Purpose	REG		REG		REG		REG		REG		FD		FD		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																										
Chloride	mg/L																									
Nitrate	mg/L	10																								
Nitrite	mg/L	1																								
DHC																										
BVC	CEQ/mL																									
Dehalococcoides	cells/mL																									
FIELD TESTS																										
Conductivity	µS/cm		1.53		1.68		1.66		1.52		1.51						1.47		2.25		0.021		2.09		1.99	
Dissolved oxygen	mg/L		0.67		1.17		0.12		0		0.63						0.68		0.52		1.04		1.17		0.19	
Oxidation-Reduction Potential	mV		-37		-5		210		-8		-13						158		136		252		250		392	
pH	SU		6.52		5.67		5.34		6.34		6.79						5.57		6.58		5.36		5.85		5.90	
Temperature	C		18.42		19.86		25.56		20.74		15.24						20.48		21.67		19.84		19.19		21.65	
Turbidity	NTU		15.5		24.8		17.3		8.1		7						161		6.5		172		20.7		7.4	
GASES																										
Carbon dioxide	µg/L																									
Ethane	µg/L																									
Ethylene	µg/L																									
Methane	µg/L																									
GENERAL CHEMISTRY																										
Ferrous Iron	mg/L																									
SULFIDE																										
Sulfide	mg/L																									
TOTAL ORGANIC CARBON																										
Total Inorganic Carbon	mg/L																									
Total organic carbon	mg/L																									
VOLATILES																										
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000																					< 1	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	0.275	J	0.538	J	0.58	J	0.451	J	0.434	J	0.369	J	0.427	J	0.418	J	3.7		2.15		< 1	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	2.58		4.27		3.57		4.73		3.46		3.61		2.93		2.77		26.3		10.8		5.6		4.2	
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 0.3	U	< 1	U	< 0.5	U
1,2,3-Trichloropropane	µg/L	0.041	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 1	U	< 0.5	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	0.666	J	0.897	J	1.31		0.79	J	0.64	J	0.657	J	0.815	J	0.799	J	5.83		3.54		3.1		1.9	
1,2-Dichloropropane	µg/L	5	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U
1,4-Dichlorobenzene	µg/L	75	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
2-Butanone	µg/L	61,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	5	UJ	< 5	U	< 5	U	< 2	U	< 1	U
2-Chlorotoluene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW14																							
		Sample ID	67WW14-012414		67WW14-050714		67WW14-072514		67WW14-120314		67WW14-021015		67WW14FD-021015		67WW14FD-051215		67WW14-051215		67WW14-111815		67WW14-051816		67WW14-112717		67WW14-180502	
		Sample Date	1/24/2014		5/7/2014		7/25/2014		12/3/2014		2/10/2015		2/10/2015		5/12/2015		5/12/2015		11/18/2015		5/18/2016		11/27/2017		5/2/2018	
		Depth	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		20.51 - 20.75		19.98 - 20.15	
		Sample Purpose	REG		REG		REG		REG		REG		FD		FD		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Acetone	µg/L	92,000	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	4	J	< 5	U	< 5	U	< 2	U	< 1	U
Benzene	µg/L	5	< 0.25	U	< 0.13	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
Bromobenzene	µg/L	2,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
Bromochloromethane	µg/L	4,100	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Bromoform	µg/L	36	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Bromomethane	µg/L	140	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	1	UJ	< 1	U	< 1	U	< 1	U	1	UJ	< 1	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
Chloroethane	µg/L	41,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
Chloromethane	µg/L	220	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	< 5	U	5	UJ	< 5	U	< 5	U	< 5	U	< 2	U	< 1	U
Methylene chloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2	U	< 1	U
Naphthalene	µg/L	2,000	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 0.4	U	< 1	U	< 0.5	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Styrene	µg/L	100	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 0.25	U	< 1	U	< 0.5	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	0.297	J	< 0.5	U	< 1	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW14				67WW15										67WW16I							
		Sample ID	67WW14-181022		67WW14-190502		67WW15-051916		67WW15-112717		67WW15-180502		67WW15-181023		67WW15-190503		67WW16I-112917		67WW16I-180503		67WW16I-181025		67WW16I-190501	
		Sample Date	10/22/2018		5/2/2019		5/19/2016		11/27/2017		5/2/2018		10/23/2018		5/3/2019		11/29/2017		5/3/2018		10/25/2018		5/1/2019	
		Depth	20.85 - 21.08		18.78 - 19.02		0 - 0		23.85 - 24.09		23.08 - 23.23		24.23 - 24.44		22.04 - 22.23		24.81 - 25		22.8 - 22.91		24.03 - 24.22		21.8 - 21.98	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
ANIONS																								
Chloride	mg/L																							
Nitrate	mg/L	10																						
Nitrite	mg/L	1																						
DHC																								
BVC	CEQ/mL																							
Dehalococcoides	cells/mL																							
FIELD TESTS																								
Conductivity	µS/cm		2.09		2.17		2.45		1.52		1.46		1.8		1.93		1.43		1		1.53		1.50	
Dissolved oxygen	mg/L		0.66		0.27		1.5		2.16		1.39		0.16		2.85		0.41		0		0.14		1.63	
Oxidation-Reduction Potential	mV		274		228		228		289		403		253		231		-2		85		41		18	
pH	SU		5.76		5.89		5.58		5.27		5.29		5.61		5.43		6.26		6.14		6.24		5.35	
Temperature	C		21.68		20.83		18.7		18.27		19.62		18.06		20.33		19.76		19.73		17.69		22.48	
Turbidity	NTU		0		30.6		6.8		55.9		12.6		2.1		0		6.3		4.3		7.6		1.9	
GASES																								
Carbon dioxide	µg/L																							
Ethane	µg/L																							
Ethylene	µg/L																							
Methane	µg/L																							
GENERAL CHEMISTRY																								
Ferrous Iron	mg/L																							
SULFIDE																								
Sulfide	mg/L																							
TOTAL ORGANIC CARBON																								
Total Inorganic Carbon	mg/L																							
Total organic carbon	mg/L																							
VOLATILES																								
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,1-Trichloroethane	µg/L	200	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5	U	< 0.5	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	3,100,000	< 0.5	U	< 0.5	U			< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1,2-Trichloroethane	µg/L	5	< 0.5	U	< 0.5	U	22.7		5.6		5.6		6		5.4		< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethane	µg/L	10,000	1.3		1.4		57.3		11		10		13		9.2		< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloroethene	µg/L	7	6.6		5.3		2460		510		380		670		330		< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,1-Dichloropropene	µg/L	2.9	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5	U	< 0.5	U	< 0.3	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5	U	< 0.5	U	< 20	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5	U	< 0.5	U	< 8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dibromo-3-chloropropane	µg/L	0	< 1	U	< 0.5	U	< 2	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U	< 1	U	< 0.5	U
1,2-Dibromoethane	µg/L	0	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichlorobenzene	µg/L	600	< 0.5	U	< 0.5	U	< 5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloroethane	µg/L	5	2.5		1.8		117		27		26		30		22		< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,2-Dichloropropane	µg/L	5	< 0.5	U	< 0.5	U	< 8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,3-Dichloropropane	µg/L	29	< 0.5	U	< 0.5	U	< 8	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
1,4-Dichlorobenzene	µg/L	75	< 0.5	U	< 0.5	U	0.173	J	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
2,2-Dichloropropane	µg/L	42	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
2-Butanone	µg/L	61,000	< 1	U	< 1	U	< 100	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U
2-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
Groundwater Results 2013-2019

		Location Code	67WW14				67WW15										67WW16I							
		Sample ID	67WW14-181022		67WW14-190502		67WW15-051916		67WW15-112717		67WW15-180502		67WW15-181023		67WW15-190503		67WW16I-112917		67WW16I-180503		67WW16I-181025		67WW16I-190501	
		Sample Date	10/22/2018		5/2/2019		5/19/2016		11/27/2017		5/2/2018		10/23/2018		5/3/2019		11/29/2017		5/3/2018		10/25/2018		5/1/2019	
		Depth	20.85 - 21.08		18.78 - 19.02		0 - 0		23.85 - 24.09		23.08 - 23.23		24.23 - 24.44		22.04 - 22.23		24.81 - 25		22.8 - 22.91		24.03 - 24.22		21.8 - 21.98	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter	Units	MCL / GW-Ind	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
2-Hexanone	µg/L	6,100	< 1	U	< 1	U	< 5	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U
4-Chlorotoluene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Acetone	µg/L	92,000	< 2	U	< 6.3	U	< 5	U	< 2	U	< 1	U	< 2	U	< 1	U	< 2	U	< 1	U	< 2	U	3.3	
Benzene	µg/L	5	< 0.5	U	< 0.5	U	0.145	J	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromobenzene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromochloromethane	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromodichloromethane	µg/L	4.6	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromoform	µg/L	36	< 0.5	U	< 0.5	U	< 20	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Bromomethane	µg/L	140	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Carbon disulfide	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	0.9	J
Carbon tetrachloride	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chlorobenzene	µg/L	100	< 0.5	U	< 0.5	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloroethane	µg/L	41,000	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloroform	µg/L	1,000	< 0.5	U	< 0.5	U	< 5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Chloromethane	µg/L	220	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	6.1	J	1.5		1.3		1.7		1.3		< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromochloromethane	µg/L	34	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dibromomethane	µg/L	380	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Dichlorodifluoromethane	µg/L	20,000	< 0.5	UJ	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Ethylbenzene	µg/L	700	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Hexachlorobutadiene	µg/L	20	< 1	U	< 1	U	0.5	UJ	< 1	U	< 0.5	U	< 1	U	< 1	U	< 1	U	< 0.5	U	< 1	U	< 1	U
Isopropylbenzene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
m,p-Xylenes	µg/L	10,000	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U
Methyl isobutyl ketone	µg/L	8,200	< 1	U	< 1	U	< 100	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U
Methylene chloride	µg/L	5	< 1	U	< 1	U	< 10	U	< 2	U	< 1	U	< 1	U	< 1	U	< 2	U	< 1	U	< 1	U	< 1	U
Naphthalene	µg/L	2,000	< 0.5	U	< 0.5	U	< 0.4	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	UJ	< 0.5	U
n-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
n-Propylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
o-Xylene	µg/L	10,000	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
p-Isopropyltoluene	µg/L	10,000	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
sec-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Styrene	µg/L	100	< 0.5	U	< 0.5	U	< 0.25	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
tert-Butylbenzene	µg/L	4,100	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Toluene	µg/L	1,000	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,2-Dichloroethene	µg/L	100	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
trans-1,3-Dichloropropene	µg/L	29	< 0.5	U	< 0.5	U	< 1	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	5.48	J	< 1	U	1.2		1.4		1.1		< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichlorofluoromethane	µg/L	31,000	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 10	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U	< 1	U	< 0.5	U	< 0.5	U	< 0.5	U

Table 2-4
2013-2019 Groundwater Results

Notes:

Bold and highlighted results indicate analyte is above the Res-GW MCL.

µS/cm - microsiemens per centimeter

µg/L - micrograms per liter

°C - degrees Celsius

cells/mL - cells per milliliter

CEQ/mL - cell equivalence per milliliter

DHC - Dehalococcoides

FD - field duplicate

GW-Ind - groundwater medium-specific concentration for industrial use

ID - identification

J - estimated value

MCL - maximum contaminant level

mg/L - milligrams per liter

mS/cm - millisiemens per centimeter

mV - millivolts

NR - not recorded

NTU - nephelometric turbidity unit

REG - regular sample

Res-GW MCL - residential groundwater MCL

SU - standard unit

U - Not detected; The analyte was analyzed for but not detected above the associated method detection limit.

Val Qual - validation qualifier

VOC - volatile organic compound

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW01																					
		Sample ID	67WW01-981208		67WW01-040912		67WW01-060806		67WW01-061218		67WW01-053113		67WW01-050714		67WW01-072514		67WW01-120314		67WW01-021015		67WW01-051915		67WW01-111915		67WW01-032916	
		Sample Date	12/8/1998		9/12/2004		8/6/2006		12/18/2006		5/31/2013		5/7/2014		7/25/2014		12/3/2014		2/10/2015		5/19/2015		11/19/2015		3/29/2016	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	560		5	U	5	U	5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	1.25	U	1.25	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	33		1	J	0.305	JH	0.28	J	0.25	U	0.5	U	0.29	J	0.483	J	1.44		1.72	J	2.14	J	2.67	
1,1-Dichloroethene	µg/L	7	380		280		153		179		139		257		224		349		544		631		694		728	
1,2-Dichloroethane	µg/L	5	27		13		5.57	JH	6.37		6.68		12.2		10.7		16.6		28.7		31.4		38.6		52.6	
Trichloroethene	µg/L	5	6.3		6		5.38	JH	5.99		2.96		3		2.3		3.36		4.07		3.03		2.84		4	

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW01								67WW02															
		Sample ID	67WW01-051916		67WW01-112817		67WW01-180503		67WW01-190503		67WW02-981208		67WW02-		67WW02-040912		67WW02-060806		67WW02-061218		67WW02-053113		67WW02-092713		67WW02-012314	
		Sample Date	5/19/2016		11/28/2017		5/3/2018		5/3/2019		12/8/1998		12/8/1998		9/12/2004		8/6/2006		12/18/2006		5/31/2013		9/27/2013		1/23/2014	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	2.5	U	1	U	0.5	U	0.5	U	100		100		5	U	5	U	5	U	0.25	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	1.62	J	1	U	1.2		1.4		6.4		5.9	J	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	714		250		450		280		2.4		10	U	5	U	5	U	5	U	0.5	U	1	U	1	U
1,2-Dichloroethane	µg/L	5	43.3		28		22		21		1	U	10	U	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	3.28	J	2.1		1.7		1.3		1	U	10	U	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW02																					
		Sample ID	67WW02-050614		67WW02-072414		67WW02-120314		67WW02-021015		67WW02-051215		67WW02FD-		67WW02-111915		67WW02-051916		67WW02FD-		67WW02-112817		67WW02-180503		67WW02-	
		Sample Date	5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		5/12/2015		11/19/2015		5/19/2016		5/19/2016		11/28/2017		5/3/2018		5/3/2018	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	1	U	1	U	1	U	3.59		13.2		13		0.857	J	67.6		66.3		1	U	190		190	
1,2-Dichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.377	J	0.321	J	1	U	2		1.9	
Trichloroethene	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW02				67WW03														67WW04				67WW05	
		Sample ID	67WW02-181025		67WW02-190501		67WW03-981208		67WW03-040912		67WW03-060809		67WW03-061218		67WW03-051215		67WW03-032916		67WW03-051916		67WW04-001219		67WW04-040912		67WW05-001219	
		Sample Date	10/25/2018		5/1/2019		12/8/1998		9/12/2004		8/9/2006		12/18/2006		5/12/2015		3/29/2016		5/19/2016		12/19/2000		9/12/2004		12/19/2000	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	1800		5	U	5	U	5	U	0.5	U	0.5	U	0.5	U	0.1	U	5	U	0.1	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	1.2		24		5	U	5	U	5	U	0.5	U	0.5	U	0.5	U	0.1	U	5	U	0.1	U
1,1-Dichloroethene	µg/L	7	6.9		180		36		5	U	5	U	5	U	1	U	1	U	1	U	0.2	U	5	U	0.2	U
1,2-Dichloroethane	µg/L	5	0.5	U	4.7		20	U	5	U	5	U	5	U	0.5	U	0.5	U	0.5	U	0.1	U	5	U	0.1	U
Trichloroethene	µg/L	5	0.5	U	0.87	J	20	U	5	U	5	U	5	U	0.5	U	0.5	U	0.5	U	0.1	U	1	J	0.1	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW05																					
		Sample ID	67WW05-040912		67WW05-060808		67WW05-061217		67WW05-053113		67WW05-092813		67WW05-012314		67WW05-050614		67WW05-072414		67WW05-120314		67WW05-021015		67WW05-051215		67WW05-111915	
		Sample Date	9/12/2004		8/8/2006		12/17/2006		5/31/2013		9/28/2013		1/23/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		11/19/2015	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	5	U	5	U	5	U	0.5	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,2-Dichloroethane	µg/L	5	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW05												67WW06											
		Sample ID	67WW05-051916		67WW05-112817		67WW05-180503		67WW05-181025		67WW05-181025-		67WW05-190502		67WW06-001219		67WW06-		67WW06-040912		67WW06-060808		67WW06-061218		67WW06-100806	
		Sample Date	5/19/2016		11/28/2017		5/3/2018		10/25/2018		10/25/2018		5/2/2019		12/19/2000		12/19/2000		9/12/2004		8/8/2006		12/18/2006		8/6/2010	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.1	U	0.1	U	5	U	5	U	5	U	0.25	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.1	U	0.1	U	5	U	5	U	5	U	0.25	U
1,1-Dichloroethene	µg/L	7	1	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.2	U	0.2	U	5	U	5	U	5	U	0.5	U
1,2-Dichloroethane	µg/L	5	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	3.51		3.5		5	U	3.02	J	1.62	J	2.39	
Trichloroethene	µg/L	5	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.14	J	0.15	J	5	U	5	U	5	U	0.25	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW06										67WW07													
		Sample ID	67WW06-053113		67WW06-053113-		67WW06-092813		67WW06-012414		67WW06-112917		67WW07-001219		67WW07-040912		67WW07-060808		67WW07-061218		67WW07-053113		67WW07-092713		67WW07-012314	
		Sample Date	5/31/2013		5/31/2013		9/28/2013		1/24/2014		11/29/2017		12/19/2000		9/12/2004		8/8/2006		12/18/2006		5/31/2013		9/27/2013		1/23/2014	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.25	U	0.25	U	0.5	U	0.5	U	1	U	0.1	U	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.25	U	0.25	U	0.5	U	0.5	U	1	U	0.1	U	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	0.5	U	0.5	U	1	U	0.752	J	1	U	0.2	U	5	U	5	U	5	U	0.5	U	1	U	1	U
1,2-Dichloroethane	µg/L	5	2.25		2.2		1.77		2.03		1		2.28		5	U	5	U	1.65	J	1.67		1.77		1.35	
Trichloroethene	µg/L	5	0.25	U	0.25	U	0.5	U	0.5	U	1	U	0.1	U	5	U	5	U	5	U	0.25	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW07																						67WW08	
		Sample ID	67WW07-050614		67WW07-072514		67WW07-120314		67WW07-021015		67WW07-051215		67WW07-111915		67WW07-051916		67WW07-112917		67WW07-180503		67WW07-181025		67WW07-190503		67WW08-060313	
		Sample Date	5/6/2014		7/25/2014		12/3/2014		2/10/2015		5/12/2015		11/19/2015		5/19/2016		11/29/2017		5/3/2018		10/25/2018		5/3/2019		6/3/2013	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.25	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	4.25	
1,1-Dichloroethene	µg/L	7	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	0.5	U	0.5	U	0.5	U	1390	J
1,2-Dichloroethane	µg/L	5	1.44		1.39		1.19		1.04		0.817	J	0.601	J	0.33	J	1	U	0.5	U	0.5	U	0.5	U	64.3	R
Trichloroethene	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	2.86	

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW08																							
		Sample ID	67WW08-100213		67WW08-012314		67WW08-050714		67WW08-072414		67WW08-120414		67WW08-021115		67WW08-051915		67WW08-111915		67WW08-051916		67WW08-112817		67WW08-112817-		67WW08-180501	
		Sample Date	10/2/2013		1/23/2014		5/7/2014		7/24/2014		12/4/2014		2/11/2015		5/19/2015		11/19/2015		5/19/2016		11/28/2017		11/28/2017		5/1/2018	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	5	U	2.5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	1	U	1	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	5.08	J	6.7		5.01	J	7.74	J	7.36	J	6.96	J	4.5	J	4.67	J	2.76	J	1	U	1	U	0.5	U
1,1-Dichloroethene	µg/L	7	1120		1340		1590		1890		2320		1930		1570		1710		1130		340		350		300	
1,2-Dichloroethane	µg/L	5	76.5		89.9		101		98.9		106		104		85.6		77.6		56.1		13		13		11	
Trichloroethene	µg/L	5	5	U	3.12	J	4.41	J	3.14	J	3.55	J	3.15	J	5	U	5	U	5	U	1	U	1	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW08						67WW09																		
		Sample ID	67WW08-181023		67WW08-181023-		67WW08-190501		67WW10-060113		67WW09-060113		67WW09-092813		67WW09-012414		67WW09-072514		67WW09-120414		67WW09-021115		67WW09FD-		67WW09-051915	
		Sample Date	10/23/2018		10/23/2018		5/1/2019		6/1/2013		6/3/2013		9/28/2013		1/24/2014		7/25/2014		12/4/2014		2/11/2015		2/11/2015		5/19/2015	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.25	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.25	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	160		160		110		0.5	U	16.1		17.5		20.8		8.93		11.6		8.17		8.29		2.71	
1,2-Dichloroethane	µg/L	5	6.5		6.2		5.1		0.25	U	0.25	U	0.414	J	0.347	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	0.5	U	0.5	U	0.5	U	0.25	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW09																67WW09A							
		Sample ID	67WW09-111815		67WW09FD-		67WW09-051816		67WW09FD-		67WW09-112717		67WW09-180502		67WW09-181023		67WW09-190503		67WW09A-092713		67WW09A-092713-		67WW09A-012314		67WW09A-050614	
		Sample Date	11/18/2015		11/18/2015		5/18/2016		5/18/2016		11/27/2017		5/2/2018		10/23/2018		5/3/2019		9/27/2013		9/27/2013		1/23/2014		5/6/2014	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	1.66	J	1.62	J	1	U	1	U	1	U	0.5	U	0.5	U	0.5	U	1	U	1	U	1	U	1	U
1,2-Dichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW09A																							
		Sample ID	67WW09A-072414		67WW09AFD-		67WW09A-120314		67WW09AFD-		67WW09A-021015		67WW09A-051215		67WW09A-111815		67WW09A-051816		67WW09A-112917		67WW09A-180503		67WW09A-181025		67WW09A-190502	
		Sample Date	7/24/2014		7/24/2014		12/3/2014		12/3/2014		2/10/2015		5/12/2015		11/18/2015		5/18/2016		11/29/2017		5/3/2018		10/25/2018		5/2/2019	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	0.5	U	0.5	U	0.5	U
1,2-Dichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

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ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW10																					
		Sample ID	67WW10-092713		67WW10-012414		67WW10-050614		67WW10-072414		67WW10-120314		67WW10-021015		67WW10-051215		67WW10-111815		67WW10-051816		67WW10-112917		67WW10-180503		67WW10-181022	
		Sample Date	9/27/2013		1/24/2014		5/6/2014		7/24/2014		12/3/2014		2/10/2015		5/12/2015		11/18/2015		5/18/2016		11/29/2017		5/3/2018		10/22/2018	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	0.5	U	0.5	U
1,2-Dichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW10		67WW11																					
		Sample ID	67WW10-190502		67WW11-060113		67WW11-060113-		67WW11-100213		67WW11 FD-		67WW11-012314		67WW11FD-		67WW11-072414		67WW11-120414		67WW11-021115		67WW11-051915		67WW11-111915	
		Sample Date	5/2/2019		6/1/2013		6/1/2013		10/2/2013		1/23/2014		1/23/2014		1/23/2014		7/24/2014		12/4/2014		2/11/2015		5/19/2015		11/19/2015	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.25	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.25	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	0.5	U	47.1		46.8		42.8		43		38.8		43		34.5		37.5		30.4		21.6		28.5	
1,2-Dichloroethane	µg/L	5	0.5	U	0.869	J	0.85	J	0.799	J	0.823	J	0.748	J	0.823	J	0.684	J	0.567	J	0.559	J	0.518	J	0.513	J
Trichloroethene	µg/L	5	0.5	U	0.25	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW11										67WW12													
		Sample ID	67WW11-051916		67WW11-112717		67WW11-180502		67WW11-181023		67WW11-190501		67WW12-060113		67WW12-100113		67WW12-012414		67WW12-050614		67WW12-072514		67WW12-120314		67WW12-021015	
		Sample Date	5/19/2016		11/27/2017		5/2/2018		10/23/2018		5/1/2019		6/1/2013		10/1/2013		1/24/2014		5/6/2014		7/25/2014		12/3/2014		2/10/2015	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	19.3		5.2		5.5		6.1		2.8		0.5	U	1	U	1	U	1	U	1	U	1	U	1	U
1,2-Dichloroethane	µg/L	5	0.396	J	1	U	0.5	U	0.5	U	0.5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.25	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW12																		67WW13					
		Sample ID	67WW12-051215		67WW12FFD-		67WW12-111815		67WW12-051816		67WW12-112917		67WW12-112917-		67WW12-180503		67WW12-181022		67WW12-190502		67WW13-053113		67WW13-100113		67WW13-012414	
		Sample Date	5/12/2015		11/18/2015		11/18/2015		5/18/2016		11/29/2017		11/29/2017		5/3/2018		10/22/2018		5/2/2019		5/31/2013		10/1/2013		1/24/2014	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	1	U	1	U	0.5	U	0.5	U	0.5	U	0.25	U	0.5	U	1.25	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	1	U	1	U	0.5	U	0.5	U	0.5	U	2.91	J	3.37		2.99	
1,1-Dichloroethene	µg/L	7	1	U	1	U	1	U	0.681	J	2.2		1.8		0.5	U	4.8		2.1		498		515		572	
1,2-Dichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	1	U	1	U	0.5	U	0.5	U	0.5	U	19.9		23.8		22.9	
Trichloroethene	µg/L	5	0.5	U			0.5	U	0.5	U	1	U	1	U	0.5	U	0.5	U	0.5	U	2.71	J	2.81		2.86	

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW13																							
		Sample ID	67WW13FD-		67WW13-050614		67WW13FD-		67WW13-072514		67WW13FD-		67WW13-120414		67WW13FD-		67WW13-021115		67WW13-051915		67WW13-111815		67WW13-051916		67WW13-112817	
		Sample Date	1/24/2014		5/6/2014		5/6/2014		7/25/2014		7/25/2014		12/4/2014		12/4/2014		2/11/2015		5/19/2015		11/18/2015		5/19/2016		11/28/2017	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	1.25	U	1	U	1	U	0.5	U	0.5	U	2.5	U	2.5	U	1.25	U	1.25	U	1.25	U	1	U	1	U
1,1,2-Trichloroethane	µg/L	5	3.01		1.99	J	1.95	J	3.48		3.56		4.4	J	4.56	J	4.87		5.96		7.66		7		5.1	
1,1-Dichloroethene	µg/L	7	569		240		228		353		362		572		522		521		522		762		274		320	
1,2-Dichloroethane	µg/L	5	22.9		13.7		12.9		19.8		20.1		24.9		24.6		26		30.6		42.6		35.7		32	
Trichloroethene	µg/L	5	2.99		1.25	J	1.27	J	1.72		1.71		1.65	J	1.94	J	2.63		2.91		3.32		1.67	J	1	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW13										67WW14													
		Sample ID	67WW13-180501		67WW13-		67WW13-181023		67WW13-190501		67WW13-190501-		67WW14-100113		67WW14-100113-		67WW14-012414		67WW14-050714		67WW14-072514		67WW14-120314		67WW14-021015	
		Sample Date	5/1/2018		5/1/2018		10/23/2018		5/1/2019		5/1/2019		10/1/2013		10/1/2013		1/24/2014		5/7/2014		7/25/2014		12/3/2014		2/10/2015	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	4.8		4.7		6.1		3.9		3.8		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	160		170		570		200		160		1.82	J	2.22		2.58		4.27		3.57		4.73		3.46	
1,2-Dichloroethane	µg/L	5	27		28		43		24		23		0.692	J	0.849	J	0.666	J	0.897	J	1.31		0.79	J	0.64	J
Trichloroethene	µg/L	5	0.5	U	0.5	U	2.4		1.1		1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW14																		67WW15					
		Sample ID	67WW14FD-		67WW14-051215		67WW14FD-		67WW14-111815		67WW14-051816		67WW14-112717		67WW14-180502		67WW14-181022		67WW14-190502		67WW15-051916		67WW15-112717		67WW15-180502	
		Sample Date	2/10/2015		5/12/2015		5/12/2015		11/18/2015		5/18/2016		11/27/2017		5/2/2018		10/22/2018		5/2/2019		5/19/2016		11/27/2017		5/2/2018	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	22.7		5.6		5.6	
1,1-Dichloroethene	µg/L	7	3.61		2.77		2.93		26.3	J	10.8		5.6		4.2		6.6		5.3		2460		510		380	
1,2-Dichloroethane	µg/L	5	0.657	J	0.799	J	0.815	J	5.83		3.54		3.1		1.9		2.5		1.8		117		27		26	
Trichloroethene	µg/L	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	5.48	J	1	U	1.2	

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-5
LHAAP-67 Historic Contaminants of Concern

		Location Code	67WW15				67WW16I							
		Sample ID	67WW15-181023		67WW15-190503		67WW16I-112917		67WW16I-180503		67WW16I-181025		67WW16I-190501	
		Sample Date	10/23/2018		5/3/2019		11/29/2017		5/3/2018		10/25/2018		5/1/2019	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	µg/L	5	6		5.4		1	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	µg/L	7	670		330		1	U	0.5	U	0.5	U	0.5	U
1,2-Dichloroethane	µg/L	5	30		22		1	U	0.5	U	0.5	U	0.5	U
Trichloroethene	µg/L	5	1.4		1.1		1	U	0.5	U	0.5	U	0.5	U

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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

Table 2-6
Well Maintenance Activities Year 5 RA-O

Well ID	Date Inspected	Pads	Bollards	Protective Casings	Locks	Date Mowed	Photos	Comments
67WW01	10/25/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/03/19						Yes	
67WW02	10/25/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/01/19						Yes	
67WW03	10/22/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/02/19						Yes	
67WW04		Good	Good	Good	In Place	04/29/19	Yes	
	05/03/19						Yes	
67WW05	10/25/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/02/19						Yes	
67WW06		Good	Good	Good	In Place	04/29/19	Yes	
	05/03/19						Yes	
67WW07	10/25/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/03/19						Yes	
67WW08	10/23/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/01/19						Yes	
67WW09	10/23/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/03/19						Yes	
67WW09A	10/25/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/02/19						Yes	
67WW10	10/22/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/02/19						Yes	
67WW11	10/23/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/01/19						Yes	
67WW12	10/22/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/02/19						Yes	
67WW13	10/23/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/01/19						Yes	
67WW14	10/22/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/02/19						Yes	
67WW15	10/23/18	Good	Good	Good	In Place	04/29/19	Yes	
	05/03/19						Yes	
67WW16I	10/25/18	Good	Good	Good	In Place	43584.00	Yes	
	05/01/19						Yes	

Notes:

RA-O - remedial action operation

Table 2-7
Year 6 RA-O Sampling

Monitoring Well ID	VOCs	Field Parameters	MNA Parameters	Water Levels
Upper Shallow				
67WW01	X	X		X
67WW02	X	X		X
67WW03	X	X		X
67WW04				X
67WW05	X	X		X
67WW06				X
67WW07	X	X		X
67WW08	X	X	X	X
67WW09	X	X		X
67WW09A	X	X		X
67WW10	X	X		X
67WW11	X	X		X
67WW12	X	X		X
67WW13	X	X	X	X
67WW14	X	X		X
67WW15	X	X		X
67WW17 [a]	X	X		X
67WW18 [a]	X	X		X
Intermediate				
67WW16I	X	X		X

Notes:

Field parameters to be monitored for all wells: pH, temperature, conductivity, turbidity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and ferric iron.

MNA parameters include alkalinity, sulfate, sulfide, chloride, TOC, dissolved iron and manganese, total phosphorus, carbon dioxide, dissolved gases (methane, ethane, ethene) and total iron.

[a] Data from initial sampling of wells 67WW17 and 67WW18 will be used to evaluate the efficacy of the current monitoring network.

ID - identification

MNA - monitored natural attenuation

RA-O - remedial action operation

TOC - total organic carbon

VOCs - volatile organic compounds

X - well will be analyzed for that parameter

Table 3-1
Mann-Kendall Trend Summary, LHAAP-67

Monitoring Well	1,1-DCE	1,2-DCA	1,1,2-TCA
67WW01	Probably Increasing	Significant Increase	NA
67WW02	Significant Increase	NA	NA
67WW08	Probably Decreasing	Significant Decrease	NA
67WW13	Stable	Significant Increase	NA
67WW15	No Trend	Stable	Stable

Notes:

DCA - dichloroethane

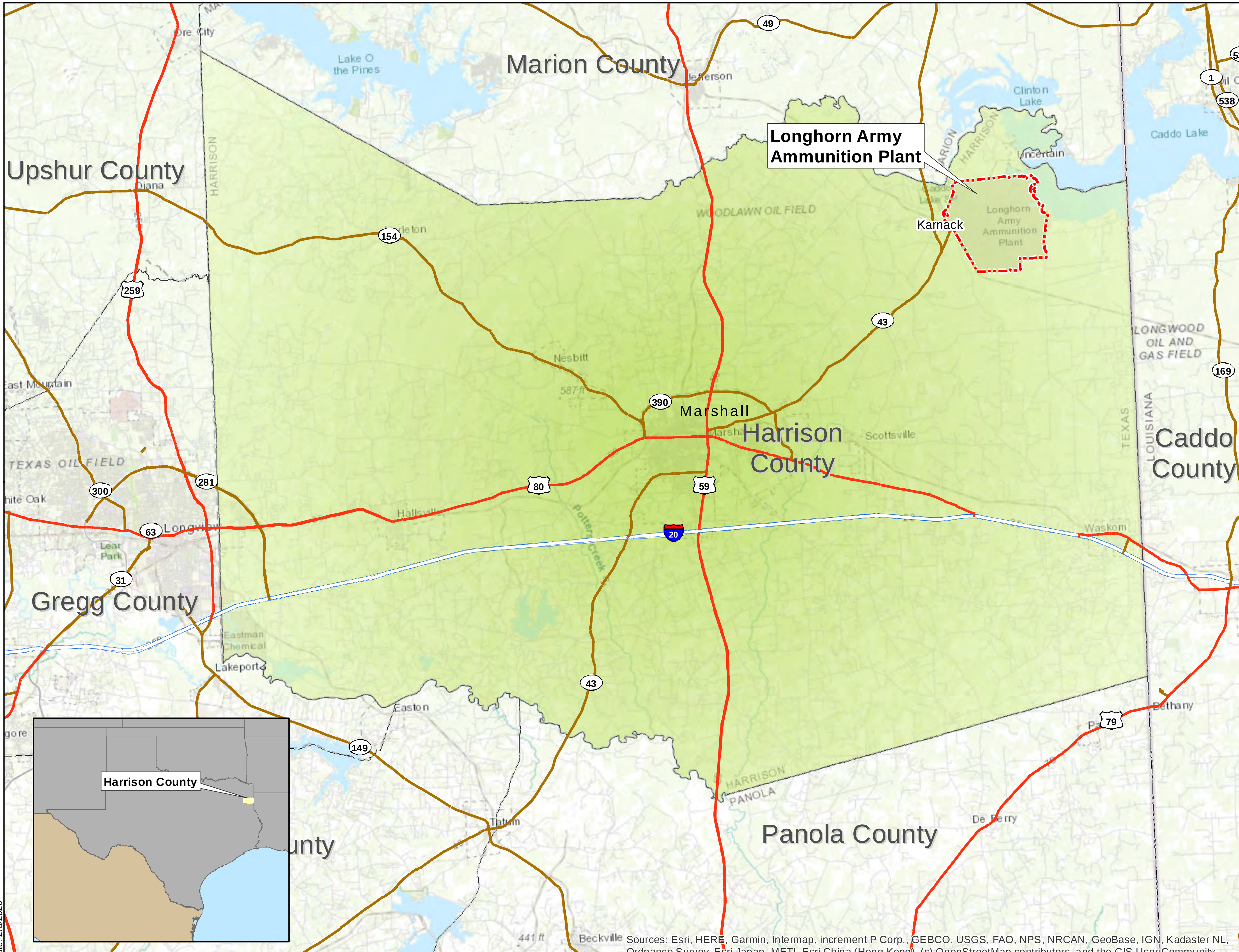
DCE - dichloroethene

MCL - maximum contaminant level

NA - not analyzed due to concentrations are below the MCL.

TCA - trichloroethane

Figures



Note:
1. RA-O = Remedial Action Operations

0 2 4 Miles

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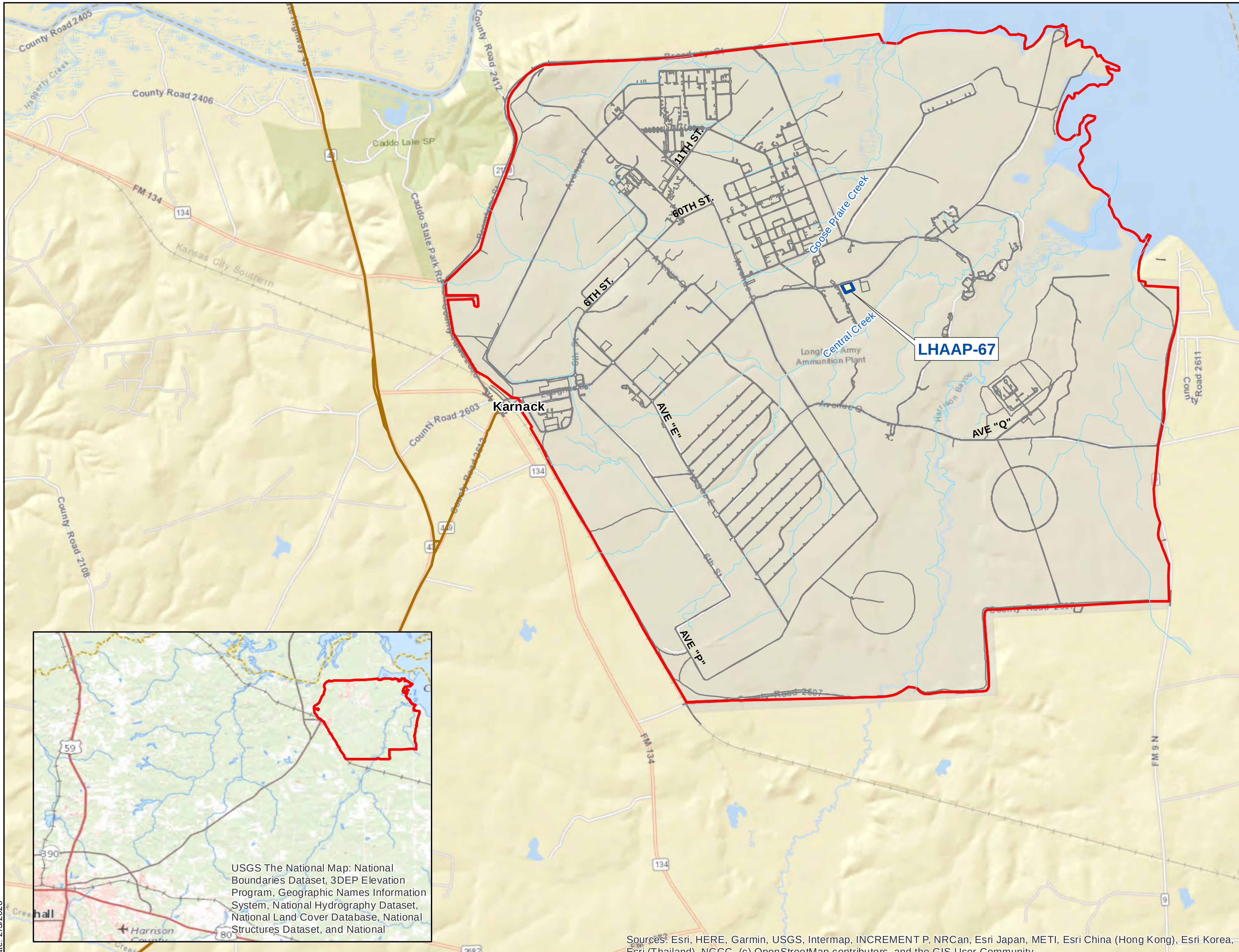
Figure 1-1

LHAAP Location Map
Fifth Annual RA-O Report
LHAAP-67

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/3/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP_LocationMap.mxd



Stream
Road
LHAAP Boundary
LHAAP-67 Site Boundary

Note:
1. RA-O = Remedial Action Operations

N

0 1,500 3,000 Feet

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Figure 1-2

LHAAP Site Vicinity Map
Fifth Annual RA-O Report
LHAAP-67

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/3/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_SiteLocationMap.mxd

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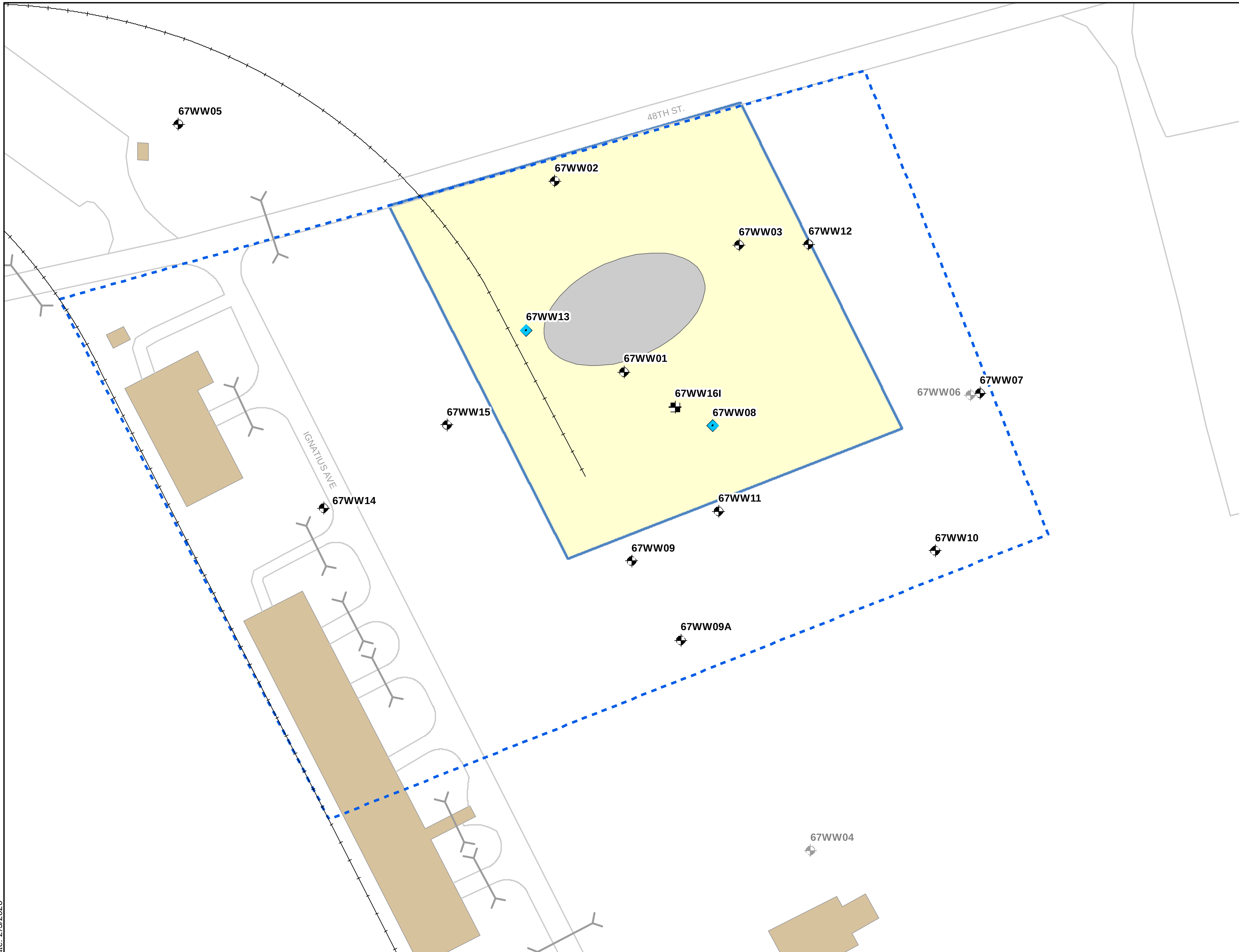

Shallow Monitoring Well
Intermediate Monitoring Well
Current MNA Parameter Analysis Well Location
Former Railroad Location
Culvert
Surveyed Land Use Control Boundary
Roads
Buildings
Approximate Tank Location
LHAAP-67 Site Boundary

Note:
1. RA-O = Remedial Action Operations
2. Monitoring wells 67WW04 and 67WW06 are no longer part of the RA-O monitoring network.

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Figure 2-1

Groundwater Monitoring Well Locations
Fifth Annual RA-O Report
LHAAP-67

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/3/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_GWMonitoringLocations.mxd

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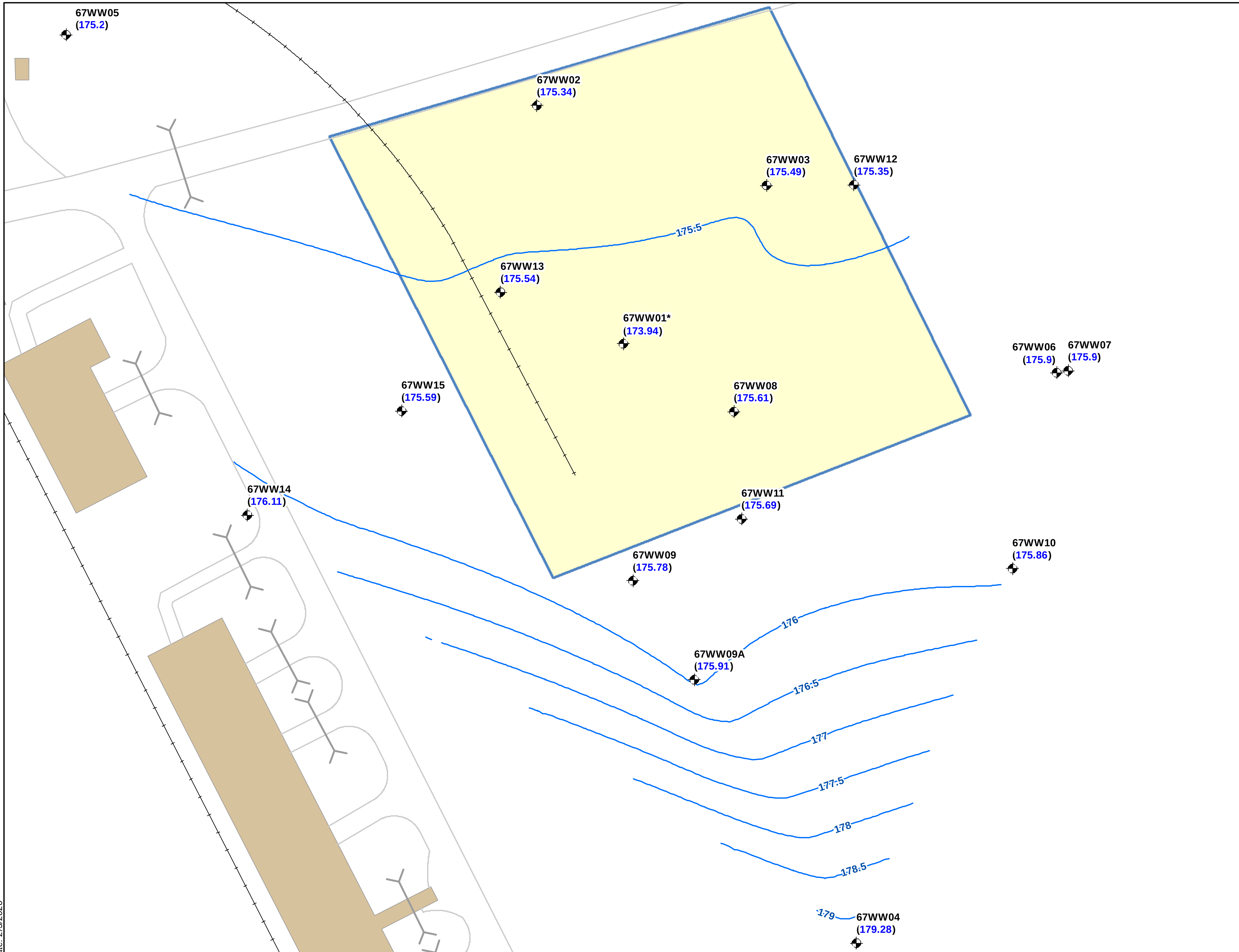

Note:
1. RA-O = Remedial Action Operations
2. * = 67WW01 appears anamolous and was not used to create the potentiometric contours.
3. Groundwater elevations are presented in feet above mean sea level (MSL).

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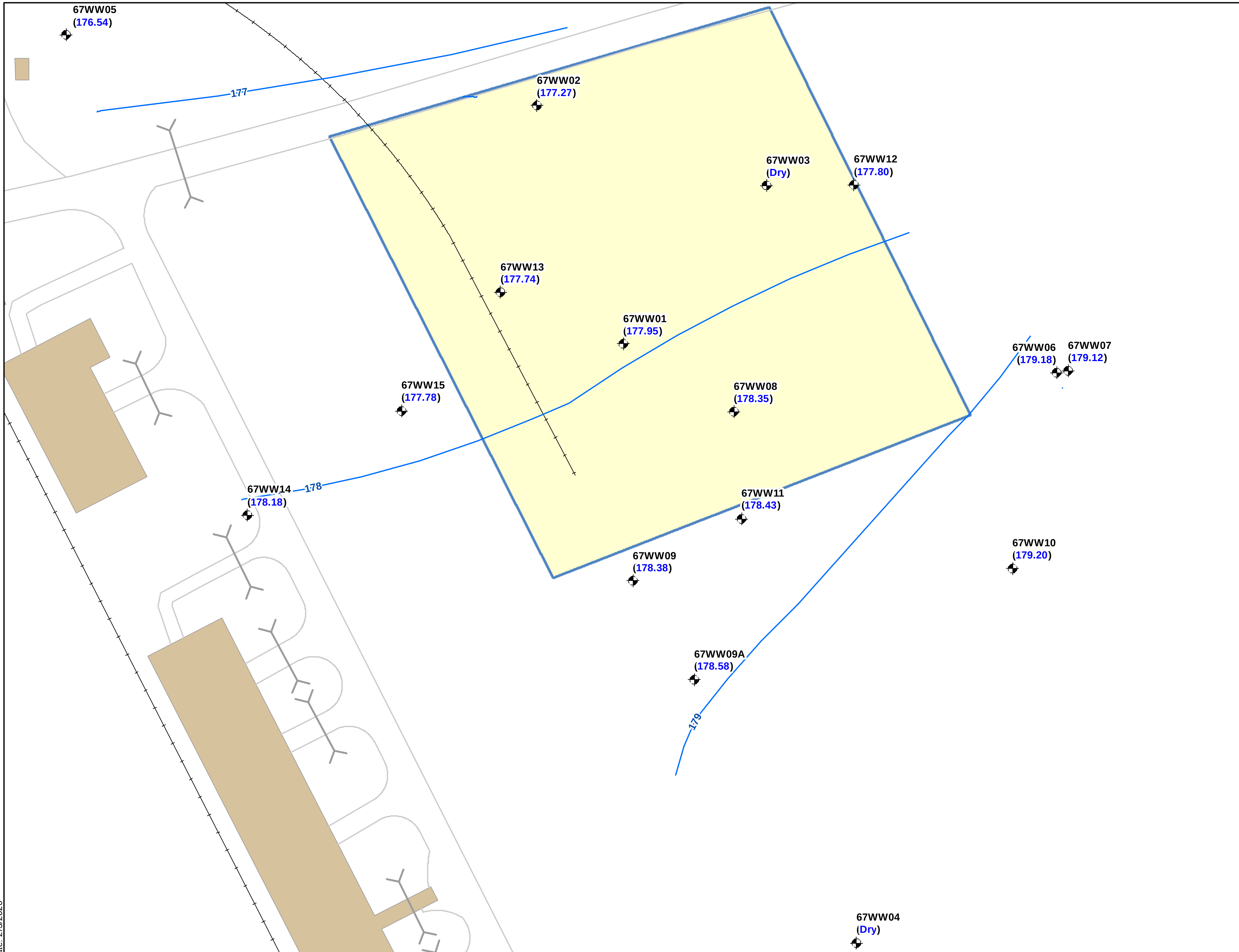
Figure 2-2
Shallow Zone Potentiometric Map - October 2018
Fifth Annual RA-O Report
LHAAP-67
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/3/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_ShallowZone_Pot_Oct2018.mxd



Shallow Monitoring Well
Former Railroad Location
Groundwater Contour
Culvert
Roads
Buildings

Note:
1. RA-O = Remedial Action Operations
2. * = 67WW07 appears anamolous and was not used to create the potentiometric contours.
3. Groundwater elevations are presented in feet above mean sea level (MSL).

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Figure 2-3
Shallow Zone Potentiometric Map - May 2019
Fifth Annual RA-O Report
LHAAP-67
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/3/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_ShallowZone_Pot_May2019.mxd

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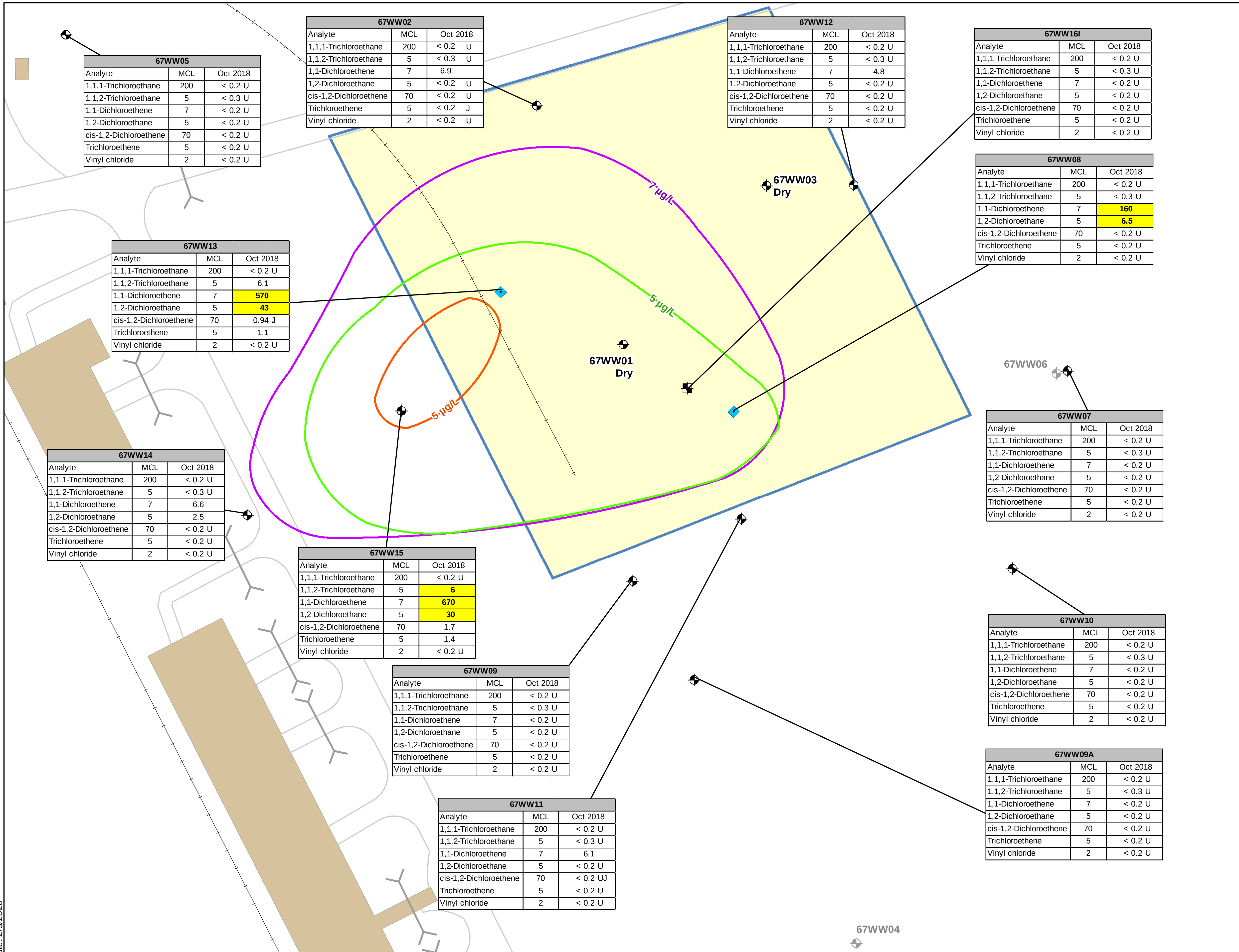

67WW05

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW02

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	6.9
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 J
Vinyl chloride	2	< 0.2 U

67WW12

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	4.8
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW16I

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW08

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	**160**
1,2-Dichloroethane	5	**6.5**
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW13

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	6.1
1,1-Dichloroethene	7	**570**
1,2-Dichloroethane	5	**43**
cis-1,2-Dichloroethene	70	0.94 J
Trichloroethene	5	1.1
Vinyl chloride	2	< 0.2 U

67WW14

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	6.6
1,2-Dichloroethane	5	2.5
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW15

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	**6**
1,1-Dichloroethene	7	**670**
1,2-Dichloroethane	5	**30**
cis-1,2-Dichloroethene	70	1.7
Trichloroethene	5	1.4
Vinyl chloride	2	< 0.2 U

67WW07

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW09

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW10

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW11

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	6.1
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 UJ
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW09A

Analyte	MCL	Oct 2018
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

Note:
1. Data Qualifiers:
J = Estimated value; analyte concentration was less than the limit of quantification.
U = Analyte was not detected
2. Result highlighted yellow indicates results exceeds MCL.
3. MCL = Maximum Contaminant Limit
4. All concentrations are in microgram per liter (µg/L)
5. RA-O = Remedial Action Operations
6. 67WW16I is an intermediate well and data was not used for contour lines

Monitoring wells 67WW04 and 67WW06 are no longer part of the RA-O monitoring network.

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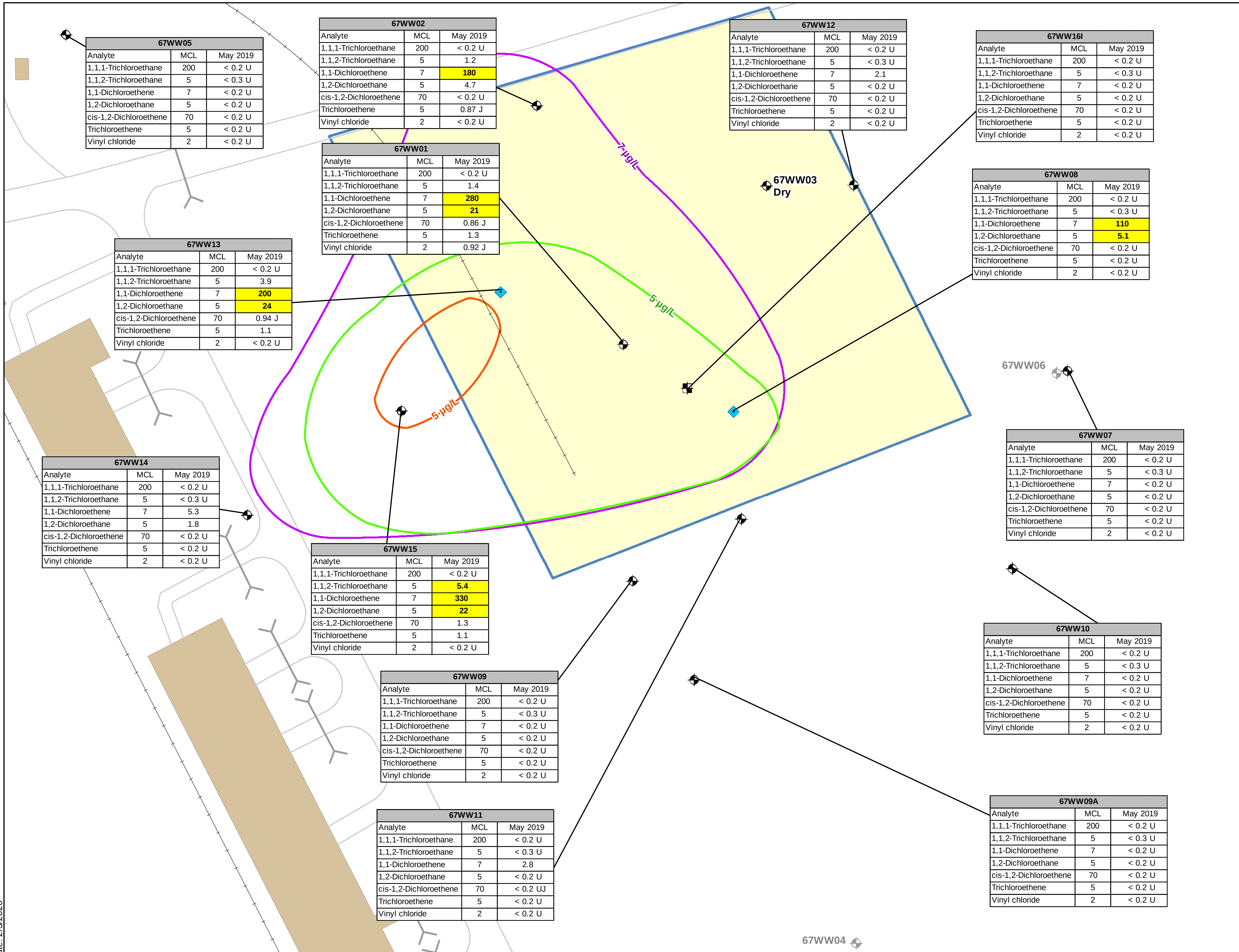
Figure 2-4
Groundwater Results
October 2018
Fifth Annual RA-O Report
LHAAP-67

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/5/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_VOCsShallowZoneOct2018_GW.mxd

00954489



67WW05		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW02		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	1.2
1,1-Dichloroethene	7	180
1,2-Dichloroethane	5	4.7
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	0.87 J
Vinyl chloride	2	< 0.2 U

67WW12		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	2.1
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW16I		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW01		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	1.4
1,1-Dichloroethene	7	280
1,2-Dichloroethane	5	21
cis-1,2-Dichloroethene	70	0.86 J
Trichloroethene	5	1.3
Vinyl chloride	2	0.92 J

67WW08		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	110
1,2-Dichloroethane	5	5.1
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW13		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	3.9
1,1-Dichloroethene	7	200
1,2-Dichloroethane	5	24
cis-1,2-Dichloroethene	70	0.94 J
Trichloroethene	5	1.1
Vinyl chloride	2	< 0.2 U

67WW14		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	5.3
1,2-Dichloroethane	5	1.8
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW07		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW15		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	5.4
1,1-Dichloroethene	7	330
1,2-Dichloroethane	5	22
cis-1,2-Dichloroethene	70	1.3
Trichloroethene	5	1.1
Vinyl chloride	2	< 0.2 U

67WW10		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW09		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW11		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	2.8
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 UJ
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

67WW09A		
Analyte	MCL	May 2019
1,1,1-Trichloroethane	200	< 0.2 U
1,1,2-Trichloroethane	5	< 0.3 U
1,1-Dichloroethene	7	< 0.2 U
1,2-Dichloroethane	5	< 0.2 U
cis-1,2-Dichloroethene	70	< 0.2 U
Trichloroethene	5	< 0.2 U
Vinyl chloride	2	< 0.2 U

Shallow Monitoring Well
Intermediate Monitoring Well
Current MNA Parameter Analysis Well Location
Former Railroad Location
1,1,2-Trichloroethane Contour
1,1-Dichloroethene Contour
1,2-Dichloroethane Contour
Culvert
Roads
Buildings
LHAAP-67 Site Boundary

Note:
1. Data Qualifiers:
J = Estimated value; analyte concentration was less than the limit of quantification.
U = Analyte was not detected
2. Result highlighted yellow indicates results exceeds MCL.
3. MCL = Maximum Contaminant Limit
4. All concentrations are in microgram per liter (µg/L)
5. RA-O = Remedial Action Operations
6. 67WW16I is an intermediate well and data was not used for contour lines

Monitoring wells 67WW04 and 67WW06 are no longer part of the RA-O monitoring network.

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Figure 2-5
Groundwater Results
May 2019
Fifth Annual RA-O Report
LHAAP-67
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/5/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_VOCsShallowZoneMay2019_GW.mxd

Cleanup Levels:
1,1-Dichlorothene = 7 µg/L
1,2-Dichlorethane = 5 µg/L
1,1,2-Trichloroethane = 5 µg/L

Notes:
1. RA-O = Remedial Action Operation

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Figure 2-6

COC Concentration Trends
Fifth Annual RA-O Report
LHAAP-67

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 9/3/2019

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_COC_Concentrations.mxd

00954491

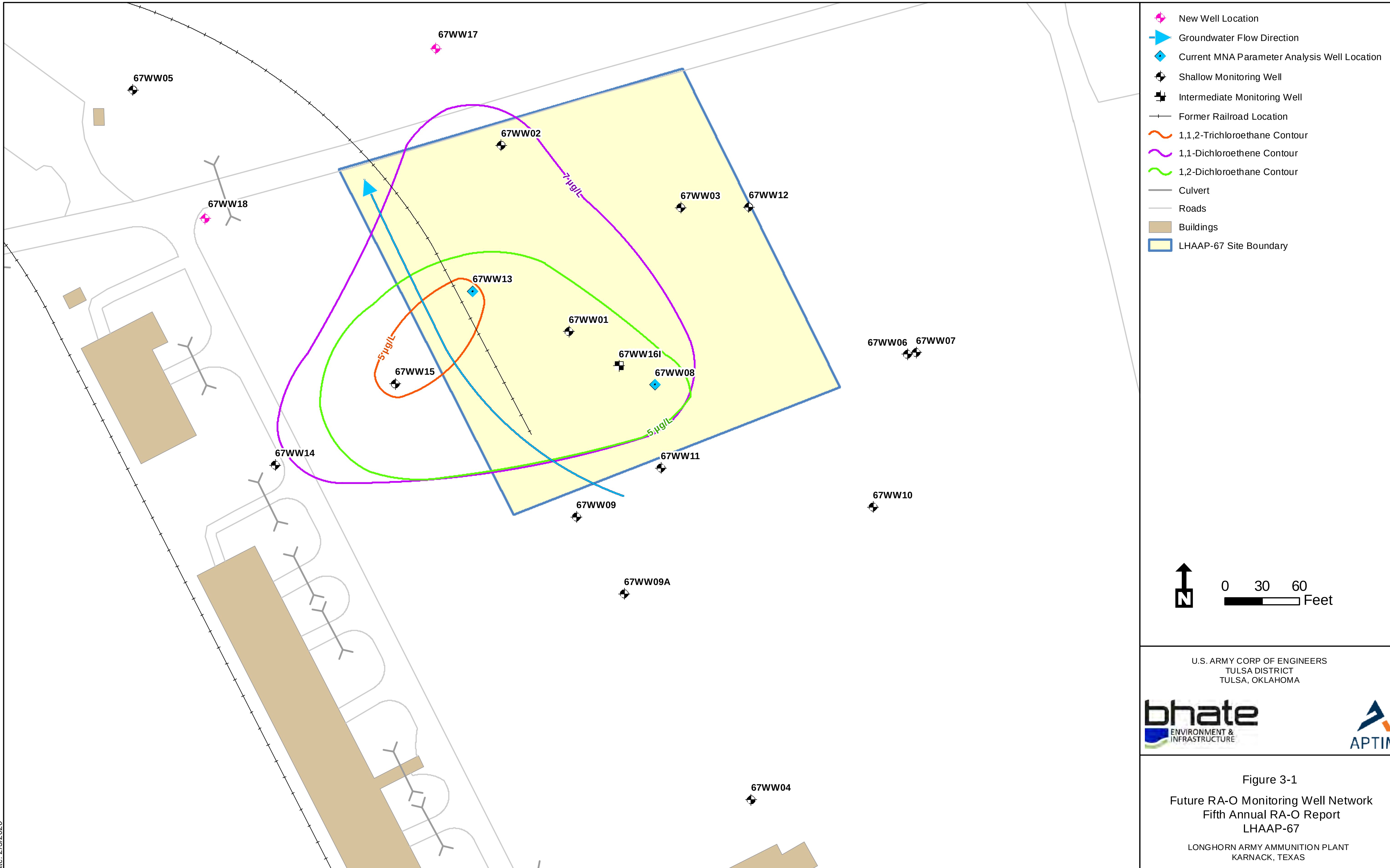

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Figure 3-1

Future RA-O Monitoring Well Network
Fifth Annual RA-O Report
LHAAP-67

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/3/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP67\RAO\Year5\LHAAP67_InstalleWellLocations.mxd

Appendix A

Annual LUC Compliance Certification and Documentation

Sample Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated September 2011 for LHAAP-67 a certification of site was conducted by APTIM [indicate transferee] on 8/14/19.

A summary of land use control mechanisms is as follows:

Groundwater restriction – restriction of the use of groundwater to environmental monitoring and testing until cleanup levels are met [Indicate whether groundwater restrictions are still required at LHAAP-67]

A summary of compliance with land use and restriction covenants is as follows:

No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-67.

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: August 14, 2019

Name/Title: Scott Beasinger / Senior Field Tech

Signature: Scott Beasinger

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year.

Appendix B

Photographic Log

PHOTO LOG

Photo No.	Date	Task and Description
1	10-26-2018	Well Inspection, 67WW01
2	10-26-2018	Well Inspection, 67WW02
3	10-26-2018	Well Inspection, 67WW03
4	10-26-2018	Well Inspection, 67WW04
5	10-26-2018	Well Inspection, 67WW05
6	10-26-2018	Well Inspection, 67WW06
7	10-26-2018	Well Inspection, 67WW07
8	10-26-2018	Well Inspection, 67WW08
9	10-26-2018	Well Inspection, 67WW09
10	10-26-2018	Well Inspection, 67WW09A
11	10-26-2018	Well Inspection, 67WW10
12	10-26-2018	Well Inspection, 67WW11
13	10-26-2018	Well Inspection, 67WW12
14	10-26-2018	Well Inspection, 67WW13
15	10-26-2018	Well Inspection, 67WW14
16	10-26-2018	Well Inspection, 67WW15
17	10-26-2018	Well Inspection, 67WW16
18	5-3-2019	Well Inspection, 67WW01
19	5-1-2019	Well Inspection, 67WW02
20	5-2-2019	Well Inspection, 67WW03
21	5-3-2019	Well Inspection, 67WW04
22	5-2-2019	Well Inspection, 67WW05
23	5-3-2019	Well Inspection, 67WW06
24	5-3-2019	Well Inspection, 67WW07
25	5-1-2019	Well Inspection, 67WW08
26	5-3-2019	Well Inspection, 67WW09
27	5-2-2019	Well Inspection, 67WW09A
28	5-2-2019	Well Inspection, 67WW10
29	5-1-2019	Well Inspection, 67WW11
30	5-2-2019	Well Inspection, 67WW12
31	5-1-2019	Well Inspection, 67WW13

PHOTO LOG

Photo No.	Date	Task and Description
32	5-2-2019	Well Inspection, 67WW14
33	5-3-2019	Well Inspection, 67WW15
34	5-1-2019	Well Inspection, 67WW16
35	8-14-2019	Northwest corner
36	8-14-2019	North center of site
37	8-14-2019	Middle of site
38	8-14-2019	Northeast corner
39	8-14-2019	Southeast corner
40	8-14-2019	Southwest corner

PHOTO 1: Well Inspection, 67WW01
DATE: October 26, 2018

PHOTO 2: Well Inspection, 67WW02
DATE: October 26, 2018

PHOTO 3: Well Inspection, 67WW03
DATE: October 26, 2018

PHOTO 4: Well Inspection, 67WW04
DATE: October 26, 2018

PHOTO 5: Well Inspection, 67WW05
DATE: October 26, 2018

PHOTO 6: Well Inspection, 67WW06
DATE: October 26, 2018

PHOTO 7: Well Inspection, 67WW07
DATE: October 26, 2018

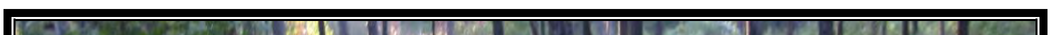


PHOTO 8: Well Inspection, 67WW08
DATE: October 26, 2018

PHOTO 9: Well Inspection, 67WW09
DATE: October 26, 2018

PHOTO 10: Well Inspection, 67WW09A
DATE: October 26, 2018

PHOTO 11: Well Inspection, 67WW10
DATE: October 26, 2018

PHOTO 12: Well Inspection, 67WW11
DATE: October 26, 2018

PHOTO 13: Well Inspection, 67WW12
DATE: October 26, 2018

PHOTO 14: Well Inspection, 67WW13
DATE: October 26, 2018

PHOTO 15: Well Inspection, 67WW14
DATE: October 26, 2018

PHOTO 16: Well Inspection, 67WW15
DATE: October 26, 2018

PHOTO 17: Well Inspection, 67WW16
DATE: October 26, 2018

PHOTO 18: Well Inspection, 67WW01
DATE: May 3, 2019

PHOTO 19: Well Inspection, 67WW02
DATE: May 1, 2019

PHOTO 20: Well Inspection, 67WW03
DATE: May 2, 2019

PHOTO 21: Well Inspection, 67WW04
DATE: May 3, 2019

PHOTO 22: Well Inspection, 67WW05
DATE: May 2, 2019

PHOTO 23: Well Inspection, 67WW06
DATE: May 3, 2019

PHOTO 24: Well Inspection, 67WW07
DATE: May 3, 2019

PHOTO 25: Well Inspection, 67WW08
DATE: May 1, 2019

PHOTO 26: Well Inspection, 67WW09
DATE: May 3, 2019

PHOTO 27: Well Inspection, 67WW09A
DATE: May 2, 2019

PHOTO 28: Well Inspection, 67WW10
DATE: May 2, 2019

PHOTO 29: Well Inspection, 67WW11
DATE: May 1, 2019

PHOTO 30: Well Inspection, 67WW12
DATE: May 2, 2019

PHOTO 31: Well Inspection, 67WW13
DATE: May 1, 2019

PHOTO 32: Well Inspection, 67WW14
DATE: May 2, 2019

PHOTO 33: Well Inspection, 67WW15
DATE: May 3, 2019

PHOTO 34: Well Inspection, 67WW16
DATE: May 1, 2019

PHOTO 35: Northwest Corner
DATE: August 14, 2019

PHOTO 36: North Center of Site
DATE: August 14, 2019

PHOTO 37: Middle of Site
DATE: August 14, 2019

PHOTO 38: Northeast Corner
DATE: August 14, 2019

PHOTO 39 Southeast Corner
DATE: August 14, 2019

PHOTO 40: Southwest Corner
DATE: August 14, 2019

Appendix C

Groundwater Sampling Forms

00954518

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW01**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Overcast

SAMPLING INFORMATION

Sample No: 67WW01-181025

DATE/TIME: 10/25/18 / 1034

Sample Interval: ___ - ___

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 26.98

Depth to Well Bottom (ft) ~~27~~ 27.00

Screen Interval (ft): 17.00-27.00

Approximate depth of pump inlet*(ft): ~~19~~ NA

Purging Method/Equipment: Low flow/Bladder Pump

Purge Start Date/Time: 10/25/18 NA

Purge End Date/Time: 10/25/18 NA

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: NA

APTIM

Sample Collection Log

Location ID: 67WW01 Sample No: 67WW01-181025

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
			Dry Well							

Logged by: ____________________ Date: __________

QC'd by: ____________________ Date: __________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**
Location ID: **67WW02**
Project No: **501032**
Sampler(s): Scott Bessinger

FIELD CONDITIONS Overcast / Light Rain

SAMPLING INFORMATION

Sample No: 67WW02-181025
DATE/TIME: 10/25/18 / 0943
Sample Interval: 24.35- 24.60

Sampling Method:
Sample Purpose: REG
Sample Matrix: GW

Appearance of Sample
Assoc. QC Samples
Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing
Casing ID (in.): 4
Depth to Water - Initial (DTWi) (ft) 24.35
Depth to Well Bottom (ft) ~~26~~ 27.92
Screen Interval (ft): ~~17.00 - 27.00~~ 18-28 SS
Approximate depth of pump inlet*(ft): ~~22~~ 25.50

Purging Method/Equipment: Low flow / Bladder Pump
Purge Start Date/Time: 10/25/18 0955
Purge End Date/Time: 10/25/18 1025
Discharge Tube Length: NA
PID Reading: NA
Discharge Tube Diameter: 1/4"
Immersible Layer: Y / N
Pump Start Time: 0955

2ND Check Depth to Well Bottom - 27.92

00954521

APTIM

Sample Collection Log

Location ID: 67WW02 Sample No: 67WW02-181025										
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	1000	100	.5	24.43	3.99	18.48	6.44	12.5	75	2.00
	1005	100	1.0	24.50	4.00	18.40	6.48	6.6	124	1.41
	1010	100	1.5	24.54	4.00	18.43	6.49	4.2	126	1.30
	1015	100	2.0	24.57	4.00	18.46	6.50	3.0	127	1.29
	1020	100	2.5	24.59	4.00	18.99	6.50	2.7	128	1.28
	1025	100	3.0	24.60	4.00	19.04	6.50	1.1	129	1.27

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW03**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Clear / Sunny

SAMPLING INFORMATION

Sample No: 67WW03-181022

DATE/TIME: 10/22/18 / 1445

Sample Interval: NA - NA

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) Dry

Depth to Well Bottom (ft) ~~24~~ 24.95

Screen Interval (ft): 14.80-24.80

Approximate depth of pump inlet*(ft): ~~18~~ NA

Purging Method/Equipment: NA

Purge Start Date/Time: NA

Purge End Date/Time: NA

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: NA

Immersible Layer: Y / N

Pump Start Time: NA

APTIM

Sample Collection Log

Location ID: 67WW03 Sample No: 67WW03-1810_22

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
			DRY		WELL					

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW05**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS OVERCAST / RAIN

SAMPLING INFORMATION

Sample No: 67WW05-181025

DATE/TIME: 10/25/18 / 0848

Sample Interval: ~~25.80~~ 26.07

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 25.80

Depth to Well Bottom (ft) 30.20

Screen Interval (ft): 20.00 - 30.00

Approximate depth of pump inlet*(ft): 28.00

Purging Method/Equipment: Low flow/BLADDER pump

Purge Start Date/Time: 10/25/18 0900

Purge End Date/Time: 10/25/18 0930

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 0900

0933
2ND CHECK DEPTH to WELL BOTTOM - 30.20

APTIM

Sample Collection Log

Location ID: 67WW05 Sample No: 67WW05-181025

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	0905	100	.5	25.88	2.89	17.16	5.09	79.5	191	0.67
	0910	100	1.0	25.95	2.83	17.69	4.99	32.3	186	0.31
	0915	100	1.5	26.00	2.76	17.75	5.14	23.0	175	0.12
	0920	100	2.0	26.03	2.75	17.81	5.15	22.7	174	0.12
	0925	100	2.5	26.05	2.75	17.87	5.16	22.0	173	0.11
	0930	100	3.0	26.07	2.75	17.93	5.17	21.3	172	0.11

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**
Location ID: **67WW05**
Project No: **501032**
Sampler(s): Scott Biesinger

FIELD CONDITIONS OVERCAST / RAIN

SAMPLING INFORMATION

Sample No: 67WW05-181025-FD
DATE/TIME: 10/25/18 / 0848
Sample Interval: 25.80- 26.07

Sampling Method:
Sample Purpose: FD
Sample Matrix: GW

Appearance of Sample
Assoc. QC Samples
Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing
Casing ID (in.): 4
Depth to Water - Initial (DTWi) (ft) 25.80
Depth to Well Bottom (ft) 30.20
Screen Interval (ft): 20.00 - 30.00
Approximate depth of pump inlet*(ft): 28.00

Purging Method/Equipment: Low flow / BLADDER PUMP
Purge Start Date/Time: 10/25/18 0900
Purge End Date/Time: 10/25/18 0930
Discharge Tube Length: NA
PID Reading: NA
Discharge Tube Diameter: 1/4"
Immersible Layer: Y / N
Pump Start Time: 0900

APTIM

Sample Collection Log

Location ID: 67WW05 Sample No: 67WW05-181025-FD

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	0905	100	.5	25.88	2.89	17.16	5.09	79.5	191	0.67
↓	0910	100	1.0	25.95	2.83	17.69	4.99	32.3	186	0.31
	0915	100	1.5	26.00	2.76	17.75	5.14	23.0	175	0.12
	0920	100	2.0	26.03	2.75	17.81	5.15	22.7	174	0.12
	0925	100	2.5	26.05	2.75	17.87	5.16	22.0	173	0.11
	0930	100	3.0	26.07	2.75	17.93	5.17	21.3	172	0.11

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

00954528

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW07**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Overcast

SAMPLING INFORMATION

Sample No: 67WW07-181025

DATE/TIME: 10/25/18 / 10 40

Sample Interval: 24.94 25.19

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 24.94

Depth to Well Bottom (ft) ~~24~~ 28.00

Screen Interval (ft): 17.85 - 28.85

Approximate depth of pump inlet*(ft): ~~19~~ 26.00

Purging Method/Equipment: Low flow/Bladder Pump

Purge Start Date/Time: 10/25/18 1055

Purge End Date/Time: 10/25/18 1125

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1055

1128

2ND Check Depth to well Bottom - 28.00

Sample Collection Log

APTIM

Location ID: 67WW07 Sample No: 67WW07-181025

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	1100	100	.5	25.01	3.79	17.51	5.52	111	160	0.57
	1105	100	1.0	25.08	3.80	17.75	5.15	80.4	188	0.25
	1110	100	1.5	25.12	3.80	17.76	5.02	67.3	197	0.11
	1115	100	2.0	25.15	3.80	17.77	5.01	66.7	198	0.11
	1120	100	2.5	25.17	3.80	17.78	5.01	66.1	199	0.10
	1125	100	3.0	25.19	3.80	17.79	5.01	65.6	200	0.10

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW08**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Cloudy / Cool

SAMPLING INFORMATION

Sample No: 67WW08-181023

DATE/TIME: 10/23/18 / 0953

Sample Interval 24.41 - 24.62

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		Anions in Water by E300, Alkalinity in Water by E310.1	1 x 250 mL HDPE	Cool 4C
			DHC in Wate by CENSUS-qPCR	1 x 1 L HDPE	Cool 4C
			Dissolved Gases in Water by RSK175	3 x 40 mL Glass	Cool 4C
			Sulfide in Water by E376.1	1 x 500 mL HDPE	NaOH>pH12; 2N Zinc Ac
			TIC in Water by E415.1	2 x 40 mL Glass	Cool 4C
			TOC in Water by E415.1	2 x 40 mL Amber	H2SO4
			VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 24.41

Depth to Well Bottom (ft) ~~40~~ 52.45

Screen Interval (ft): 26.96-51.46

Approximate depth of pump inlet*(ft): ~~38.35~~ 39.21

Purging Method/Equipment: Low flow / Bladder Pump

Purge Start Date/Time: 10/23/18 1010

Purge End Date/Time: 10/23/18 1045

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1010

10:48
2nd Check Depth to Bottom of Well - 52.45

APTIM

Sample Collection Log

Location ID: 67WW08 Sample No: 67WW08-181023

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/23/18	1015	100	.5	24.48	6.37	17.78	6.37	0.0	168	0.41
	1020	100	1.0	24.55	6.35	17.95	6.34	0.0	159	0.22
	1025	100	1.5	24.58	6.32	18.00	6.33	0.0	155	0.15
	1030	100	2.0	24.60	6.30	18.05	6.33	0.0	153	0.09
	1035	100	2.5	24.61	6.29	18.09	6.33	0.0	151	0.09
	1040	100	3.0	24.62	6.29	18.12	6.33	0.0	150	0.08
	1045	100	3.5	24.62	6.29	18.14	6.33	0.0	150	0.08

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW08**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Cloudy / Cool

SAMPLING INFORMATION

Sample No: 67WW08-181023-FD

DATE/TIME: 10/23/18 / 0953

Sample Interval: 24.41 - 24.62

Sampling Method:

Sample Purpose: FD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		Anions in Water by E300, Alkalinity in Water by E310.1	1 x 250 mL HDPE	Cool 4C
			DHC in Wate by CENSUS-qPCR	1 x 1 L HDPE	Cool 4C
			Dissolved Gases in Water by RSK175	3 x 40 mL Glass	Cool 4C
			Sulfide in Water by E376.1	1 x 500 mL HDPE	NaOH>pH12; 2N Zinc Ac
			TIC in Water by E415.1	2 x 40 mL Glass	Cool 4C
			TOC in Water by E415.1	2 x 40 mL Amber	H2SO4
			VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 24.41

Depth to Well Bottom (ft) 52.45

Screen Interval (ft): 26.96 - 51.46

Approximate depth of pump inlet*(ft): ~~35.05~~ 39.21

Purging Method/Equipment: Low Flow / Bladder Pump

Purge Start Date/Time: 10/23/18 10:10

Purge End Date/Time: 10/23/18 1045

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1010

APTIM

Sample Collection Log

Location ID: 67WW08 Sample No: 67WW08-181023FD										
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/23/18	1015	100	.5	24.48	6.37	17.78	6.37	0.0	168	0.41
	1020	100	1.0	24.55	6.35	17.95	6.34	0.0	159	0.22
	1025	100	1.5	24.58	6.32	18.00	6.33	0.0	155	0.15
	1030	100	2.0	24.60	6.30	18.05	6.33	0.0	153	0.09
	1035	100	2.5	24.61	6.29	18.09	6.33	0.0	151	0.09
	1040	100	3.0	24.62	6.24	18.12	6.33	0.0	150	0.08
	1045	100	3.5	24.62	6.29	18.14	6.33	0.0	150	0.08

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW09**

Project No: **501032**

Sampler(s): Scott Bresinger

FIELD CONDITIONS CLOUDY / COOL

SAMPLING INFORMATION

Sample No: 67WW09-181023

DATE/TIME: 10/23/18 / 1204

Sample Interval: 22.43 - 22.65

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 22.43

Depth to Well Bottom (ft) ~~[illegible]~~ 38.00

Screen Interval (ft): 17.43 - 37.43

Approximate depth of pump inlet*(ft): ~~24.95~~ 27.43

Purging Method/Equipment: Low flow / BLADDER Pump

Purge Start Date/Time: 10/23/18 1215

Purge End Date/Time: 10/23/18 1245

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1215

12:48

2ND CHECK Depth to WELL BOTTOM - 38.00

00954535

APTIM

Sample Collection Log

Location ID: 67WW09 Sample No: 67WW09-181023										
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/23/18	1220	100	.5	22.50	3.37	18.55	6.36	8.7	215	0.59
	1225	100	1.0	22.56	3.37	18.60	6.34	3.3	210	0.23
	1230	100	1.5	22.60	3.36	18.64	6.24	1.2	205	0.11
	1235	100	2.0	22.62	3.35	18.68	6.23	0.7	204	0.11
	1240	100	2.5	22.64	3.35	18.71	6.23	0.0	204	0.10
	1245	100	3.0	22.65	3.35	18.75	6.23	0.0	203	0.10

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW09A**

Sampler(s): Scott Bessinger

FIELD CONDITIONS OVERCAST

SAMPLING INFORMATION

Sample No: 67WW09A-181025

DATE/TIME: 10/25/18 / 1144

Sample Interval 27.02 27.26

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): ~~4~~ 2"

Depth to Water - Initial (DTWi) (ft) 27.02

Depth to Well Bottom (ft) ~~39~~ 38.71

Screen Interval (ft): 22.80-37.50

Approximate depth of pump inlet*(ft): ~~28.15~~ 30.15

Purging Method/Equipment: Low flow Bladder Pump

Purge Start Date/Time: 10/25/18 1155

Purge End Date/Time: 10/25/18 1225

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1155

1238

2nd check Depth to Well Bottom - 38.71

APTIM

Sample Collection Log

Location ID: 67WW09A Sample No: 67WW09A-181025

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	1200	100	.5	27.10	2.85	17.39	6.18	1.4	128	0.55
↓	1205	100	1.0	27.16	3.16	17.64	6.10	0.0	150	0.23
	1210	100	1.5	27.20	3.24	17.69	6.05	0.0	140	0.06
	1215	100	2.0	27.23	3.25	17.72	6.05	0.0	139	0.06
	1220	100	2.5	27.25	3.26	17.75	6.04	0.0	139	0.06
	1225	100	3.0	27.26	3.26	17.79	6.04	0.0	138	0.05

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW09A**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Overcast

SAMPLING INFORMATION

Sample No: 67WW09A-181025-MS

DATE/TIME: 10/25/18 / 1144

Sample Interval: 27.02 - 27.26

Sampling Method:

Sample Purpose: MS

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Lowflow / Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/25/18 1155

Depth to Water - Initial (DTWi) (ft) 27.02

Purge End Date/Time: 10/25/18 1225

Depth to Well Bottom (ft) ~~[illegible]~~ 38.71

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 22.80 - 37.50

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~[illegible]~~ 30.15

Pump Start Time: 1225

APTIM

Sample Collection Log

Location ID: 67WW09A Sample No: 67WW09A-181025-MS

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	1200	100	.5	27.10	2.85	17.39	6.18	1.4	128	0.55
	1205	100	1.0	27.16	3.16	17.64	6.10	0.0	150	0.23
	1210	100	1.5	27.20	3.24	17.69	6.05	0.0	140	0.06
	1215	100	2.0	27.23	3.25	17.72	6.05	0.0	139	0.06
	1220	100	2.5	27.25	3.26	17.75	6.04	0.0	139	0.06
	1225	100	3.0	27.26	3.26	17.79	6.04	0.0	138	0.05

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW09A**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS OVERCAST

SAMPLING INFORMATION

Sample No: 67WW09A-181025-MSD

DATE/TIME: 10/25/18 / 1144

Sample Interval: 27.02 27.26

Sampling Method:

Sample Purpose: MSD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 27.02

Depth to Well Bottom (ft) ~~38~~ 38.71

Screen Interval (ft): 22.80 - 37.50

Approximate depth of pump inlet*(ft): ~~28.15~~ 30.15

Purging Method/Equipment: Low flow/BLADDER Pump

Purge Start Date/Time: 10/25/18 1155

Purge End Date/Time: 10/25/18 1225

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1225

APTIM

Sample Collection Log

Location ID: 67WW09A Sample No: 67WW09A-181025-MSD

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	1200	100	.5	27.10	2.85	17.39	6.18	1.4	128	0.55
↓	1205	100	1.0	27.16	3.16	17.64	6.10	0.0	150	0.23
	1210	100	1.5	27.20	3.24	17.69	6.05	0.0	140	0.06
	1215	100	2.0	27.23	3.25	17.72	6.05	0.0	139	0.06
	1220	100	2.5	27.25	3.26	17.75	6.04	0.0	139	0.06
	1225	100	3.0	27.26	3.26	17.79	6.04	0.0	138	0.05

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW10**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Clear / Sunny

SAMPLING INFORMATION

Sample No: 67WW10-181022

DATE/TIME: 10/22/18 / 1355

Sample Interval: 25.65 - 25.88

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 25.65

Depth to Well Bottom (ft) 50.90

Screen Interval (ft): 18.70 - 50.20

Approximate depth of pump inlet*(ft): ~~34.35~~ 34.45

Purging Method/Equipment: Low flow / Bladder Pump

Purge Start Date/Time: 10/22/18 1405

Purge End Date/Time: 10/22/18 1435

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1405

1438

2nd check Depth to well Bottom - 50.90

APTIM

Sample Collection Log

Location ID: 67WW10 Sample No: 67WW10-181022

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/22/18	1410	100	.5	25.73	5.17	18.83	5.72	32.5	168	0.98
	1415	100	1.0	25.80	5.18	18.71	5.53	34.0	179	0.41
	1420	100	1.5	25.83	5.18	18.65	5.52	33.4	179	0.19
	1425	100	2.0	25.85	5.18	18.61	5.51	32.5	178	0.19
	1430	100	2.5	25.87	5.17	18.57	5.51	31.9	178	0.18
	1435	100	3.0	25.88	5.17	18.54	5.51	31.2	178	0.18

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**
Project No: **501032**
Location ID: **67WW11**
Sampler(s): Scott Bessinger

FIELD CONDITIONS Cloudy / cool

SAMPLING INFORMATION

Sample No: 67WW11-181023
DATE/TIME: 10/23/18 / 1014
Sample Interval: ~~23.45~~ 24.20

Sampling Method:
Sample Purpose: REG
Sample Matrix: GW

Appearance of Sample
Assoc. QC Samples
Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing
Casing ID (in.): 4
Depth to Water - Initial (DTWi) (ft) 23.95
Depth to Well Bottom (ft) ~~45.5~~ 47.05
Screen Interval (ft): 21.75 - 46.25
Approximate depth of pump inlet*(ft): ~~32.75~~ 34.00

Purging Method/Equipment: Lowflow/Bladder Pump
Purge Start Date/Time: 10/23/18 1125
Purge End Date/Time: 10/23/18 1155
Discharge Tube Length: NA
PID Reading: NA
Discharge Tube Diameter: 1/4"
Immersible Layer: Y / N
Pump Start Time: 1125

11:58
2nd check Depth to well Bottom - 47.05

APTIM

Sample Collection Log

Location ID: 67WW11 Sample No: 67WW11-181023

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/23/18	1130	100	.5	24.03	5.00	17.77	6.52	9.3	213	0.55
	1135	100	1.0	24.10	4.99	18.02	6.48	4.1	181	0.21
	1140	100	1.5	24.14	4.99	18.02	6.45	1.9	171	0.07
	1145	100	2.0	24.18	4.98	18.03	6.45	0.6	170	0.07
	1150	100	2.5	24.18	4.98	18.04	6.45	0.0	169	0.06
	1155	100	3.0	24.20	4.98	18.05	6.45	0.0	168	0.06

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW12**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Clear / Sunny

SAMPLING INFORMATION

Sample No: 67WW12-181022

DATE/TIME: 10/22/18 / 1305

Sample Interval: ~~26.30~~ - 26.55

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/22/18 1315

Depth to Water - Initial (DTWi) (ft) 26.30

Purge End Date/Time: 10/22/18 1345

Depth to Well Bottom (ft) ~~37~~ 37.08

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 26.96-36.46

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~26.75~~ 31.71

Pump Start Time: 1315

13:47
2nd check Depth of well Bottom = 37.08

APTIM

Sample Collection Log

Location ID: 67WW12 Sample No: 67WW12-181022

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/22/18	1320	100	.5	26.38	3.99	19.24	6.02	0.0	188	0.94
	1325	100	1.0	26.45	4.65	18.90	5.57	0.0	235	0.51
	1330	100	1.5	26.48	5.23	18.86	5.65	0.0	212	0.31
	1335	100	2.0	26.51	5.23	18.83	5.66	0.0	211	0.30
	1340	100	2.5	26.53	5.24	18.80	5.67	0.0	210	0.29
	1345	100	3.0	26.55	5.24	18.77	5.68	0.0	209	0.29

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

00954548

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW13**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy / Cool

SAMPLING INFORMATION

Sample No: 67WW13-181023

DATE/TIME: 10/23/18 / 0851

Sample Interval: ~~22.38~~- 22.62

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		Anions in Water by E300, Alkalinity in Water by E310.1	1 x 250 mL HDPE	Cool 4C
			DHC in Wate by CENSUS-qPCR	1 x 1 L HDPE	Cool 4C
			Dissolved Gases in Water by RSK175	3 x 40 mL Glass	Cool 4C
			Sulfide in Water by E376.1	1 x 500 mL HDPE	NaOH>pH12; 2N Zinc Ac
			TIC in Water by E415.1	2 x 40 mL Glass	Cool 4C
			TOC in Water by E415.1	2 x 40 mL Amber	H2SO4
			VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/23/18 0905

Depth to Water - Initial (DTWi) (ft) 22.38

Purge End Date/Time: 10/23/18 0935

Depth to Well Bottom (ft) ~~28.5~~ 28.75

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 13.60-28.10

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~17.75~~ 25.00

Pump Start Time: 0905

0938
~~2ND~~ 2ND check Depth to Bottom of well - 28.75

APTIM

Sample Collection Log

Location ID: 67WW13 Sample No: 67WW13-181022

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/23/18	0910	100	.5	22.45	5.40	17.87	6.20	0.0	258	0.97
	0915	100	1.0	22.51	5.40	18.37	5.88	0.0	278	0.40
	0920	100	1.5	22.55	5.40	18.39	5.80	0.0	279	0.20
	0925	100	2.0	22.58	5.39	18.43	5.79	0.0	280	0.20
	0930	100	2.5	22.60	5.39	18.47	5.78	0.0	280	0.19
	0935	100	3.0	22.62	5.39	18.49	5.78	0.0	281	0.19

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW14**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS CLEAR / SUNNY

SAMPLING INFORMATION

Sample No: 67WW14-181022

DATE/TIME: 10/22/18 / 1214

Sample Interval: ~~20.85~~ - 21.08

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / BLADDER Pump

Casing ID (in.): 2

Purge Start Date/Time: 10/22/18 1225

Depth to Water - Initial (DTWi) (ft) 20.85

Purge End Date/Time: 10/22/18 1255

Depth to Well Bottom (ft) ~~32.5~~ 30.47

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 20.40-30.40

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~19.5~~ 25.40

Pump Start Time: 1225

12:55
2ND CHECK Depth to well Bottom ~ 30.47

APTIM

Sample Collection Log

Location ID: 67WW14 Sample No: 67WW14-181022										
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/22/18	1230	100	.5	20.93	2.22	21.07	5.71	40.1	251	1.21
	1235	100	1.0	20.98	2.17	21.74	5.71	12.9	275	0.87
	1240	100	1.5	21.02	2.10	21.72	5.74	3.2	275	0.69
	1245	100	2.0	21.04	2.10	21.70	5.75	1.9	274	0.68
	1250	100	2.5	21.06	2.09	21.69	5.75	0.7	274	0.67
	1255	100	3.0	21.08	2.09	21.68	5.76	0.0	274	0.66

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW15**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Cloudy | Cool

SAMPLING INFORMATION

Sample No: 67WW15-181023

DATE/TIME: 10/23/18 / 1255

Sample Interval: 24.23- 24.44

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/23/18 1305

Depth to Water - Initial (DTWi) (ft) 24.23

Purge End Date/Time: 10/23/18 1335

Depth to Well Bottom (ft) 47.59

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 37.53 - 47.23

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~39.00~~ 42.38

Pump Start Time: 1305

13:38

2ND CHECK Depth of Well Bottom - 47.59

APTIM

Sample Collection Log

Location ID: 67WW15 Sample No: 67WW15-181023

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/23/18	1310	100	.5	24.30	1.81	17.83	5.85	10.3	249	0.66
	1315	100	1.0	24.36	1.80	18.02	5.64	6.9	252	0.29
	1320	100	1.5	24.39	1.80	18.03	5.63	4.0	252	0.17
	1325	100	2.0	24.41	1.80	18.04	5.62	3.2	253	0.17
	1330	100	2.5	24.43	1.80	18.05	5.61	2.5	253	0.17
	1335	100	3.0	24.44	1.80	18.06	5.61	2.1	253	0.16

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW16I**

Sampler(s): Scott Blesinger

FIELD CONDITIONS

OVERCAST

SAMPLING INFORMATION

Sample No: 67WW16I-181025

DATE/TIME: 10/25/18 / 1037

Sample Interval: 24.03 24.22

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	Lab	COC Notes	Analyses	Container	Preserv
	ALSHT		VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 24.03

Depth to Well Bottom (ft) 80.49

Screen Interval (ft): 70.43 - 80.13

Approximate depth of pump inlet*(ft): ~~[illegible]~~ 75.28

Purging Method/Equipment: Lowflow / BLADDER Pump

Purge Start Date/Time: 10/25/18 1250

Purge End Date/Time: 10/25/18 1320

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: ~~[illegible]~~ ~~[illegible]~~ 1250

1323
2ND CHECK DEPTH to WELL BOTTOM - 80.49

00954555

APTIM

Sample Collection Log

Location ID: 67WW16I				Sample No: 67WW16I-181025						
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
10/25/18	1255	100	.5	24.08	1.47	17.22	6.35	5.9	56	0.49
	1300	100	1.0	24.12	1.53	17.59	6.25	7.1	42	0.23
	1305	100	1.5	24.16	1.53	17.61	6.24	7.4	42	0.15
	1310	100	2.0	24.19	1.53	17.63	6.24	7.9	41	0.15
	1315	100	2.5	24.21	1.53	17.66	6.24	7.8	41	0.15
↓	1320	100	3.0	24.22	1.53	17.69	6.24	7.6	41	0.14

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**
Location ID: **67WW01**
Project No: **501032**
Sampler(s): Scott Beesinger

FIELD CONDITIONS Clear/Sunny

SAMPLING INFORMATION

Sample No: 67WW01-190503
DATE/TIME: 5/3/19 / 0730
Sample Interval: 22.97 23.23

Sampling Method:
Sample Purpose: REG
Sample Matrix: GW

Appearance of Sample
Assoc. QC Samples
Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing
Purging Method/Equipment: Lowflow/Bladder Pump
Casing ID (in.): 4
Purge Start Date/Time: 5/3/19 0740
Depth to Water - Initial (DTWi) (ft) 22.97
Purge End Date/Time: 5/3/19 0810
Depth to Well Bottom (ft) 27.03
Discharge Tube Length: NA
PID Reading: NA
Screen Interval (ft): 17.00 - 27.00
Discharge Tube Diameter: 1/4"
Immersible Layer: Y / N
Approximate depth of pump inlet*(ft): 24.00
Pump Start Time: 0740
Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PREPURGE - 22.97

00954557

APTIM

Sample Collection Log

Location ID: 67WW01				Sample No: 67WW01-190503						
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/3/19	0745	100	.5	23.06	3.64	21.13	6.06	149	230	1.43
	0750	100	1.0	23.12	3.64	20.11	6.44	120	216	0.77
	0755	100	1.5	23.16	3.66	20.01	6.20	103	203	0.49
	0800	100	2.0	23.19	3.67	19.94	6.19	102	203	0.48
	0805	100	2.5	23.21	3.67	19.87	6.18	101	202	0.47
	0810	100	3.0	23.23	3.67	19.81	6.17	100	202	0.46

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW02**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW02-190501

DATE/TIME: 5/1/19 / 1056

Sample Interval: 22.42- 22.67

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/1/19 1105

Depth to Water - Initial (DTWi) (ft) 22.42

Purge End Date/Time: 5/1/19 1135

Depth to Well Bottom (ft) ~~26~~ 27.80

Discharge Tube Length: NA

PID Reading: NA

18-28 SS

Screen Interval (ft): ~~17.00 - 27.00~~

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~20~~ 24.00

Pump Start Time: 1105

Ferrous Iron (Required Y or N) ______ mg/L

2ND DTW PRE-PURGE - 22.42

APTIM

Sample Collection Log

Location ID: 67WW02 Sample No: 67WW02-190501

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/1/19	1110	100	.5	22.50	4.02	23.40	5.75	15.0	18	1.21
	1115	100	1.0	22.56	4.03	23.67	5.78	6.7	57	0.51
	1120	100	1.5	22.60	4.03	23.77	5.76	3.1	70	0.29
	1125	100	2.0	22.63	4.03	23.85	5.75	1.5	71	0.28
	1130	100	2.5	22.65	4.03	23.92	5.75	0.8	72	0.27
	1135	100	3.0	22.67	4.03	24.00	5.74	0.0	73	0.27

Logged by: __________ Date: __________

QC'd by: __________ Date: __________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW02**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Cloudy

SAMPLING INFORMATION

Sample No: 67WW02-190501-FD

DATE/TIME: 5/1/19 / 1056

Sample Interval: 22.42 22.67

Sampling Method:

Sample Purpose: FD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Lowflow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/1/19 1105

Depth to Water - Initial (DTWi) (ft) 22.42

Purge End Date/Time: 5/1/19 1135

Depth to Well Bottom (ft) ~~28~~ 27.80

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.00-27.00~~

18-28 SS

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~20~~ 24.00

Pump Start Time: 1105

Ferrous Iron (Required Y or N) ______ mg/L

APTIM

Sample Collection Log

Location ID: 67WW02	Sample No: 67WW02-190501-FD									
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/1/19	1110	100	.5	22.50	4.02	23.40	5.75	15.0	18	1.21
	1115	100	1.0	22.56	4.03	23.67	5.78	6.7	57	0.51
	1120	100	1.5	22.60	4.03	23.77	5.76	3.1	70	0.29
	1125	100	2.0	22.63	4.03	23.85	5.75	1.5	71	0.28
	1130	100	2.5	22.65	4.03	23.92	5.75	0.8	72	0.27
	1135	100	3.0	22.67	4.03	24.00	5.74	0.0	73	0.27

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

00954562

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW03**

Project No: **501032**

Sampler(s): Scott Blessinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW03-190502

DATE/TIME: 5/2/19 / 1015

Sample Interval: ___ - ___

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: NA

Casing ID (in.): 4

Purge Start Date/Time: NA

Depth to Water - Initial (DTWi) (ft) Dry

Purge End Date/Time: NA

Depth to Well Bottom (ft) ~~24~~ 24.90

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 14.80 - 24.80

Discharge Tube Diameter: NA

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~19~~

Pump Start Time: NA

Ferrous Iron (Required Y or N) ____________ mg/L

APTIM

Sample Collection Log

Location ID: 67WW03   Sample No: 67WW03-1905_02

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
			Dry		Well					

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW05**

Sampler(s): Scott Bessinger

FIELD CONDITIONS

Cloudy / Light Rain

SAMPLING INFORMATION

Sample No: 67WW05-190502

DATE/TIME: 5/2/19 / 0923

Sample Interval: 24.46 24.68

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/2/19 0935

Depth to Water - Initial (DTWi) (ft) 24.46

Purge End Date/Time: 5/2/19 1005

Depth to Well Bottom (ft) 30.13

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 20.00 - 30.00

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 26.00

Pump Start Time: 0935

Ferrous Iron (Required Y or N) ____________ mg/L

2nd DTW pre-purge - 24.46

APTIM

Sample Collection Log

Location ID: 67WW05 **Sample No: 67WW05-190502**

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/2/19	0940	100	.5	24.53	2.60	20.53	5.30	64.5	183	2.83
↓	0945	100	1.0	24.59	2.62	20.23	4.30	59.3	219	2.59
	0950	100	1.5	24.62	2.64	20.20	4.13	56.9	244	2.05
	0955	100	2.0	24.64	2.65	20.17	4.12	56.3	245	2.03
	1000	100	2.5	24.66	2.65	20.14	4.11	55.7	246	2.01
	1005	100	3.0	24.68	2.65	20.10	4.11	55.2	247	1.99

Logged by: ____________________ Date: __________

QC'd by: ____________________ Date: __________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW07**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS

CLEAR/SUNNY

SAMPLING INFORMATION

Sample No: **67WW07-190503**

DATE/TIME: 5/3/19 / 1000

Sample Interval: 21.72 - 21.95

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow/BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/3/19 1005

Depth to Water - Initial (DTWi) (ft) 21.72

Purge End Date/Time: 5/3/19 1035

Depth to Well Bottom (ft) ~~24~~ 27.88

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 17.85-27.85

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 22.85

Pump Start Time: 1005

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PRE-PURGE - 21.72

00954567

APTIM

Sample Collection Log

Location ID: 67WW07	Sample No: 67WW07-190503									
Date of Reading	**Time of Reading**	**Purge Rate**	**Total Purge**	**DTW**	**Cond.**	**Temp.**	**pH**	**Turbidity**	**ORP**	**DO**
		(ml/min)	**(L)**	**(ft)**	**(mS/cm)**	**(°C)**		**(NTU)**	**(mV)**	**(mg/L)**
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/3/19	1010	100	.5	21.80	3.68	20.72	5.96	50.7	200	0.65
	1015	100	1.0	21.86	3.69	20.33	5.29	35.3	228	0.16
	1020	100	1.5	21.90	3.70	20.31	5.07	32.9	246	0.07
	1025	100	2.0	21.92	3.70	20.29	5.06	32.3	247	0.07
	1030	100	2.5	21.94	3.70	20.27	5.06	31.8	248	0.06
	1035	100	3.0	21.95	3.70	20.26	5.05	31.4	249	0.07

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW08**

Sampler(s): Scott Bursinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: **67WW08-190501**

DATE/TIME: 5/1/19 / 0822

Sample Interval: 21.67- 21.90

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Anions in Water by 9056	1 x 250 mL HDPE	Cool 4C
		ALSHT	Carbon Dioxide in Water by RSK175	3 x 40 mL Glass	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 21.67

Depth to Well Bottom (ft) ~~49~~ 51.95

Screen Interval (ft): 26.96- 51.46

Approximate depth of pump inlet*(ft): ~~35.85~~ 39.21

Ferrous Iron (Required Y or N) 0.21 mg/L

Purging Method/Equipment: Low flow/Bladder Pump

Purge Start Date/Time: 5/1/19 0830

Purge End Date/Time: 5/1/19 0900

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 0830

2ND DTW pre-purge - 21.67

APTIM

Sample Collection Log

Location ID: 67WW08 **Sample No: 67WW08-190501**

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/1/19	0835	100	.5	21.75	6.48	20.67	6.10	0.0	146	0.73
	0840	100	1.0	21.81	6.34	20.48	5.95	0.0	135	0.18
	0845	100	1.5	21.85	6.30	20.47	5.85	0.0	137	0.09
	0850	100	2.0	21.88	6.29	20.46	5.84	0.0	137	0.09
	0855	100	2.5	21.90	6.28	20.45	5.83	0.0	138	0.08
	0900	100	3.0	21.90	6.28	20.44	5.82	0.0	138	0.08

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW09**

Sampler(s): Scott Blesinger

FIELD CONDITIONS CLEAR / SUNNY

SAMPLING INFORMATION

Sample No: 67WW09-190503

DATE/TIME: 5/3/19 / 0914

Sample Interval: 19.83 - 20.06

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/3/19 0920

Depth to Water - Initial (DTWi) (ft) 19.83

Purge End Date/Time: 5/3/19 0950

Depth to Well Bottom (ft) ~~34.5~~ 37.88

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 17.43-37.43

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~24.25~~ 27.43

Pump Start Time: 0920

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PRE-PURGE - 19.83

APTIM

Sample Collection Log

Location ID: 67WW09 **Sample No: 67WW09-190503**

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/3/19	0925	100	.5	19.91	3.45	20.41	6.26	3.9	216	1.06
	0930	100	1.0	19.96	3.48	20.17	5.35	1.4	240	0.43
	0935	100	1.5	20.00	3.48	20.14	5.37	0.5	249	0.13
	0940	100	2.0	20.03	3.49	20.10	5.36	0.0	250	0.14
	0945	100	2.5	20.05	3.49	20.07	5.36	0.0	250	0.13
	0950	100	3.0	20.06	3.49	20.04	5.36	0.0	250	0.13

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

00954572

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW09A**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW09A-190502

DATE/TIME: 5/2/19 / 1155

Sample Interval: 24.35-24.58

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/2/19 1205

Depth to Water - Initial (DTWi) (ft) 24.35

Purge End Date/Time: 5/2/19 1235

Depth to Well Bottom (ft) ~~39~~ 38.77

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 22.80-37.50

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~30.15~~ 30.15

Pump Start Time: 1205

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PRE-PURGE - 24.35

APTIM

Sample Collection Log

Location ID: 67WW09A	Sample No: 67WW09A-190502									
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/2/19	1210	100	.5	24.42	3.41	21.20	6.47	30.3	95	0.94
	1215	100	1.0	24.47	3.37	20.77	6.03	24.1	120	0.31
	1220	100	1.5	24.51	3.40	20.75	6.00	23.7	121	0.10
	1225	100	2.0	24.54	3.41	20.78	6.00	23.9	122	0.09
	1230	100	2.5	24.56	3.42	20.82	6.00	24.2	123	0.09
	1235	100	3.0	24.58	3.42	20.80	6.00	24.0	123	0.09

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW09A**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW09A-190502-MS

DATE/TIME: 5/2/19 / 1155

Sample Interval: 24.35 - 24.58

Sampling Method:

Sample Purpose: MS

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/2/19 1205

Depth to Water - Initial (DTWi) (ft) 24.35

Purge End Date/Time: 5/2/19 1235

Depth to Well Bottom (ft) ~~39~~ 38.77

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 22.80-37.50

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~28.75~~ 30.15

Pump Start Time: 1205

Ferrous Iron (Required Y or N) ____________ mg/L

APTIM

Sample Collection Log

Location ID: 67WW09A   Sample No: 67WW09A-1905 02 -MS

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/2/19	1210	100	.5	24.42	3.41	21.20	6.47	30.3	95	0.44
	1215	100	1.0	24.47	3.37	20.77	6.03	24.1	120	0.31
	1220	100	1.5	24.51	3.40	20.75	6.00	23.7	121	0.10
	1225	100	2.0	24.54	3.41	20.78	6.00	23.9	122	0.09
	1230	100	2.5	24.56	3.42	20.82	6.00	24.2	123	0.09
	1235	100	3.0	24.58	3.42	20.80	6.00	24.0	123	0.09

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW09A**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW09A-1905 02-MSD

DATE/TIME: 5/2/19 / 11:55

Sample Interval: 24.35 - 24.58

Sampling Method:

Sample Purpose: MSD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/2/19 1205

Depth to Water - Initial (DTWi) (ft) 24.35

Purge End Date/Time: 5/2/19 1235

Depth to Well Bottom (ft) ~~39~~ 38.77

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 22.80-37.50

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~29.15~~ 30.15

Pump Start Time: 1205

Ferrous Iron (Required Y or N) __________ mg/L

APTIM

Sample Collection Log

Location ID: 67WW09A Sample No: 67WW09A-190502-MSD

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/2/19	1210	100	.5	24.42	3.41	21.20	6.47	30.3	95	0.94
	1215	100	1.0	24.47	3.37	20.77	6.03	24.1	120	0.31
	1220	100	1.5	24.51	3.40	20.75	6.00	23.7	121	0.10
	1225	100	2.0	24.54	3.41	20.78	6.00	23.9	122	0.09
	1230	100	2.5	24.56	3.42	20.82	6.00	24.2	123	0.09
	1235	100	3.0	24.58	3.42	20.80	6.00	24.0	123	0.09

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

00954578

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW10**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW10-190502

DATE/TIME: 5/2/19 / 1110

Sample Interval: 22.31 - 22.53

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/2/19 1115

Depth to Water - Initial (DTWi) (ft) 22.31

Purge End Date/Time: 5/2/19 1145

Depth to Well Bottom (ft) ~~50~~ 50.80

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 18.70 - 50.20

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~34.75~~ 34.45

Pump Start Time: 1115

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PRE-PURGE - 22.31

APTIM

Sample Collection Log

Location ID: 67WW10	Sample No: 67WW10-190502									
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/2/19	1120	100	.5	22.39	5.81	20.65	5.76	10.3	140	0.77
	1125	100	1.0	22.45	5.83	20.54	5.52	15.9	153	0.19
	1130	100	1.5	22.48	5.81	20.51	5.40	24.1	156	0.06
	1135	100	2.0	22.50	5.80	20.49	5.39	24.7	157	0.06
	1140	100	2.5	22.52	5.80	20.47	5.38	25.0	157	0.07
	1145	100	3.0	22.53	5.80	20.46	5.37	25.4	157	0.06

Logged by: __________ Date: __________

QC'd by: __________ Date: __________

00954580

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW11**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW11-1905 01

DATE/TIME: 5/1/19 / 0915

Sample Interval: 21.21 - 21.44

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/1/19 0925

Depth to Water - Initial (DTWi) (ft) 21.21

Purge End Date/Time: 5/1/19 0955

Depth to Well Bottom (ft) ~~45.5~~ 46.64

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 21.75 - 46.25

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~32.75~~ 34.00

Pump Start Time: 0925

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PRE-PURGE - 21.21

APTIM

Sample Collection Log

Location ID: 67WW11	Sample No: 67WW11-190501									
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/1/19	0930	100	.5	21.28	4.82	20.96	6.15	8.0	159	0.91
	0935	100	1.0	21.34	4.61	20.68	5.40	6.2	190	0.64
	0940	100	1.5	21.39	4.63	20.66	5.30	6.7	193	0.53
	0945	100	2.0	21.41	4.64	20.64	5.30	6.9	194	0.52
	0950	100	2.5	21.43	4.65	20.62	5.30	7.4	195	0.51
	0955	100	3.0	21.44	4.65	20.60	5.29	7.8	195	0.50

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW12**

Sampler(s): Scott Bersinger

FIELD CONDITIONS Cloudy / Drizzle

SAMPLING INFORMATION

Sample No: 67WW12-190502

DATE/TIME: 5/2/19 / 1022

Sample Interval: 23.85- 24.05

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/2/19 1030

Depth to Water - Initial (DTWi) (ft) 23.85

Purge End Date/Time: 5/2/19 1100

Depth to Well Bottom (ft) ~~34~~ 36.94

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 26.96-36.46

Discharge Tube Diameter: 1/4"

Immersible Layer: Y N

Approximate depth of pump inlet*(ft): ~~28.76~~ 31.71

Pump Start Time: 1030

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PRE-PURGE - 23.85

Sample Collection Log

APTIM

Location ID: 67WW12 Sample No: 67WW12-190502										
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/2/19	1035	100	.5	23.92	3.64	20.36	5.75	17.9	142	1.29
	1040	100	1.0	23.96	3.59	20.09	5.48	9.3	177	0.83
	1045	100	1.5	24.00	3.58	20.07	5.38	8.5	185	0.64
	1050	100	2.0	24.02	3.57	20.10	5.37	7.9	186	0.63
	1055	100	2.5	24.04	3.56	20.15	5.36	7.0	186	0.62
	1100	100	3.0	24.05	3.56	20.12	5.35	6.3	187	0.61

Logged by: ____________________ Date: ____________

QC'd by: ____________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW13**

Sampler(s): Scott Bersinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: **67WW13-1905**01

DATE/TIME: 5/1/19 / 0721

Sample Interval: 20.18 - 20.40

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Anions in Water by 9056	1 x 250 mL HDPE	Cool 4C
		ALSHT	Carbon Dioxide in Water by RSK175	3 x 40 mL Glass	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Lowflow/BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/1/19 0730

Depth to Water - Initial (DTWi) (ft) 20.18

Purge End Date/Time: 5/1/19 0800

Depth to Well Bottom (ft) ~~25~~ 28.60

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 13.60-28.10

Discharge Tube Diameter: 1/4"

Immersible Layer: Y N

Approximate depth of pump inlet*(ft): ~~17.35~~ 20.85

Pump Start Time: 0730

Ferrous Iron (Required Y or N) 0.00 mg/L

2ND DTW PRE-PURGE - 20.18

APTIM

Sample Collection Log

Location ID: 67WW13	Sample No: 67WW13-190501									
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/1/19	0735	100	.5	20.25	4.77	22.36	6.93	0.0	~~[illegible]~~ 180	3.39
	0740	100	1.0	20.30	4.82	21.63	5.81	0.0	199	2.97
	0745	100	1.5	20.34	4.82	21.55	5.50	0.0	206	2.85
	0750	100	2.0	20.37	4.83	21.49	5.49	0.0	207	2.82
	0755	100	2.5	20.39	4.83	21.41	5.49	0.0	208	2.79
	0800	100	3.0	20.40	4.83	21.37	5.48	0.0	209	2.77

Logged by: ______________________ Date: ____________

QC'd by: ______________________ Date: ____________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW13**

Project No: **501032**

Sampler(s): Scott Bresingar

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW13-190501-FD

DATE/TIME: 5/1/19 / 0721

Sample Interval: 20.18 - 20.40

Sampling Method:

Sample Purpose: FD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Anions in Water by 9056	1 x 250 mL HDPE	Cool 4C
		ALSHT	Carbon Dioxide in Water by RSK175	3 x 40 mL Glass	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/1/19 0730

Depth to Water - Initial (DTWi) (ft) 20.18

Purge End Date/Time: 5/1/19 0800

Depth to Well Bottom (ft) ~~28.5~~ 28.60

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 13.60 - 28.10

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~17.78~~ 20.85

Pump Start Time: 0730

Ferrous Iron (Required Y or N) 0.00 mg/L

APTIM

Sample Collection Log

Location ID: 67WW13	Sample No: 67WW13-190501-FD									
Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/1/19	0735	100	.5	20.25	4.77	22.36	6.43	0.0	180	3.39
↓	0740	100	1.0	20.30	4.82	21.63	5.81	0.0	199	2.97
	0745	100	1.5	20.34	4.82	21.55	5.50	0.0	206	2.85
	0750	100	2.0	20.37	4.83	21.49	5.49	0.0	207	2.82
	0755	100	2.5	20.39	4.83	21.41	5.49	0.0	208	2.79
	0800	100	3.0	20.40	4.83	21.37	5.48	0.0	209	2.77

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW14**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy / Light Rain

SAMPLING INFORMATION

Sample No: 67WW14-190502

DATE/TIME: 5/2/19 / 0833

Sample Interval: 18.78- 1902

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow Bladder Pump

Casing ID (in.): 2

Purge Start Date/Time: 5/2/19 0845

Depth to Water - Initial (DTWi) (ft) 18.78

Purge End Date/Time: 5/2/19 0915

Depth to Well Bottom (ft) ~~27.5~~ 30.62

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 20.40-30.40

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~19.5~~ 25.40

Pump Start Time: 0845

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW pre-purge - 18.78

APTIM

Sample Collection Log

Location ID: 67WW14 **Sample No: 67WW14-190502**

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/2/19	0850	100	.5	18.85	2.16	21.37	6.32	17.4	215	1.11
	0855	100	1.0	18.91	2.15	20.96	5.98	30.3	226	0.49
	0900	100	1.5	18.95	2.16	20.92	5.90	30.1	227	0.30
	0905	100	2.0	18.97	2.17	20.89	5.89	30.4	227	0.29
	0910	100	2.5	19.00	2.17	20.86	5.89	30.5	228	0.28
	0915	100	3.0	19.02	2.17	20.83	5.89	30.6	228	0.27

Logged by: ______________________ Date: __________

QC'd by: ______________________ Date: __________

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **67WW15**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Clear / Sunny

SAMPLING INFORMATION

Sample No: 67WW15-1905~~D~~23

DATE/TIME: 5/3/19 / 0823

Sample Interval: 22.04- 22.23

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/3/19 0835

Depth to Water - Initial (DTWi) (ft) 22.04

Purge End Date/Time: 5/3/19 0905

Depth to Well Bottom (ft) 47.43

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 37.53- 47.23

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~39.05~~ 42.38

Pump Start Time: 0835

Ferrous Iron (Required Y or N) ______ mg/L

2ND DTW PRE-PURGE- 22.04

APTIM

Sample Collection Log

Location ID: 67WW15	Sample No: 67WW15-190503									
Date of Reading	**Time of Reading**	**Purge Rate**	**Total Purge**	**DTW**	**Cond.**	**Temp.**	**pH**	**Turbidity**	**ORP**	**DO**
		(ml/min)	**(L)**	**(ft)**	**(mS/cm)**	**(°C)**		**(NTU)**	**(mV)**	**(mg/L)**
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/3/19	0840	100	~~[illegible]~~ .5	22.10	1.94	20.30	6.31	0.0	184	3.67
	0845	100	1.0	22.15	1.92	20.26	5.80	0.0	208	3.38
	0850	100	1.5	22.19	1.92	20.28	5.45	0.0	229	2.91
	0855	100	2.0	22.21	1.93	20.30	5.44	0.0	230	2.88
	0900	100	2.5	22.22	1.93	20.32	5.44	0.0	231	2.86
	0905	100	3.0	22.23	1.93	20.33	5.43	0.0	231	2.85

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

00954592

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **67WW16I**

Sampler(s): Scott Bersinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 67WW16I-190501

DATE/TIME: 5/1/19 / 1005

Sample Interval: 21.80-21.98

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/1/19 1015

Depth to Water - Initial (DTWi) (ft) 21.80

Purge End Date/Time: 5/1/19 1045

Depth to Well Bottom (ft) 80.38

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 70.43-80.13

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): ~~75.05~~ 75.28

Pump Start Time: 1015

Ferrous Iron (Required Y or N) ____________ mg/L

2ND DTW PRE-PURGE - 21.80

APTIM

Sample Collection Log

Location ID: 67WW16I **Sample No: 67WW16I-190501**

Date of Reading	Time of Reading	Purge Rate	Total Purge	DTW	Cond.	Temp.	pH	Turbidity	ORP	DO
		(ml/min)	(L)	(ft)	(mS/cm)	(°C)		(NTU)	(mV)	(mg/L)
	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
5/1/19	1020	100	.5	21.85	1.49	22.61	6.01	4.5	12	3.95
	1025	100	1.0	21.90	1.50	22.55	5.57	3.4	20	2.41
	1030	100	1.5	21.93	1.50	22.53	5.36	2.9	19	1.70
	1035	100	2.0	21.95	1.50	22.51	5.35	2.5	18	1.67
	1040	100	2.5	21.97	1.50	22.49	5.35	2.1	18	1.65
	1045	100	3.0	21.98	1.50	22.48	5.35	1.9	18	1.63

Logged by: ______________________ Date: ______________

QC'd by: ______________________ Date: ______________

00954594

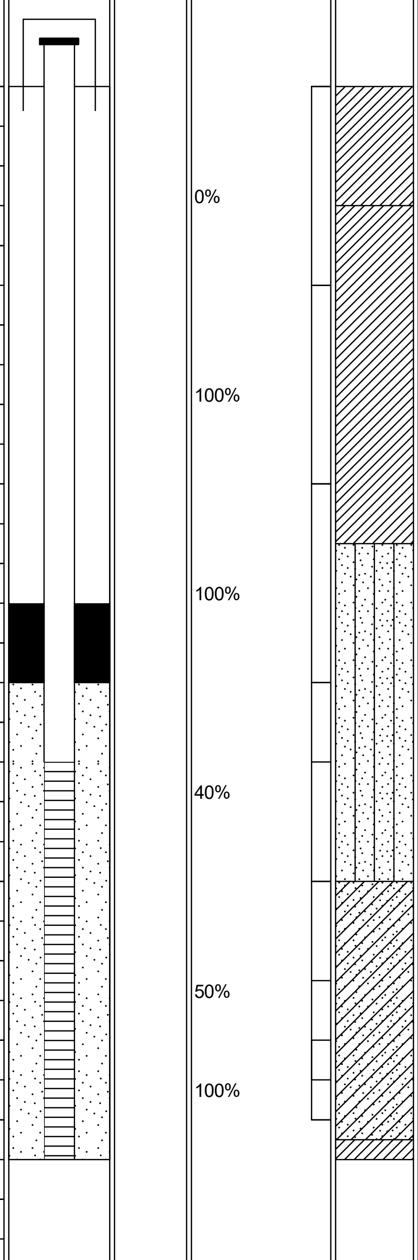
APTIM

Drilling Log

Monitoring Well **67WW17**

Project: *Longhorn Army Ammunition Plant* Owner: *U.S. Army*
Location: *LHAAP-67* Proj. No.: *501032*
Surface Elev.: *NA* Total Hole Depth: *27.0 ft.* North: East:
Top of Casing: *NA* Water Level Initial: *~20' bgs* Static: *NA* Diameter: *10 in.*
Screen: Dia: *4 in.* Length: *10 ft.* Type/Size: *SCH. 40 PVC/0.010 in.*
Casing: Dia: *4 in.* Length: *17 ft.* Type: *SCH. 40 PVC*
Fill Material: *20/40 Sand, Bent. Chips, Portland Cement Grout* Rig/Core: *Dietrich B-50 Tracked Rig*
Drill Co.: *ETTL* Driller Name: Pedro Gonzales Driller #: *59385*
Log By: *W. Foss* Date: *8/8/19*

COMMENTS:
4" Dia. well set at 27' bgs with 10' Sch. 40 PVC 0.010" slot screen



Depth (ft.)	PID (ppm)	Sample ID % Recovery	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
0–3		0%	CL	**SILTY CLAY**; brownish yellow (10YR 6/6), firm, damp, some roots.
3–11.5		100%	CL	**SANDY CLAY**; light gray (10YR 7/1) with brownish yellow (10YR 6/6) mottles, firm to stiff, damp, trace iron manganese oxide (FeMnO) staining. Hard to very hard, dry @ 6.5', color change to yellowish red (5YR 5/6) with light gray mottles.
11.5–20		100%, 40%	SM	**SILTY SAND**; very pale brown (10YR 8/2), medium dense, damp, slight orangeish staining. Color change to light yellowish brown (10YR 6/4) @ 16' with increasing clay. Color change to very pale brown @ 19', moist to very moist, increasing silt content.
20–26.5		50%, 100%	SC	**CLAYEY SAND**; very pale brown (10YR 8/2), loose, saturated, trace silt, some orangeish staining. Color change @ 21.5' to light yellowish brown (10YR 6/4), loose, saturated, some silt.
26.5–27			CL	**SILTY CLAY**; light yellowish brown (10YR 6/4), stiff, damp, trace sand mottles of yellowish red (5YR 5/8). END OF BORING AT 27 FEET.

00954595

Drilling Log

APTIM

Monitoring Well **67WW18**

Project: Longhorn Army Ammunition Plant
Owner: U.S. Army
Location: LHAAP-67
Proj. No.: 501032
Surface Elev.: NA
Total Hole Depth: 42.0 ft.
North:
East:
Top of Casing: NA
Water Level Initial: ~15.5' bgs
Static: NA
Diameter: 10 in.
Screen: Dia: 4 in.
Length: 10 ft.
Type/Size: SCH. 40 PVC/0.010 in.
Casing: Dia: 4 in.
Length: 29ft.
Type: SCH. 40 PVC
Fill Material: Filter Sand, Bentonite Chips
Rig/Core: Dietrich B-50 Tracked Rig
Drill Co.: ETTL
Driller Name: Rich Hermann
Driller #: 59385
Log By: W. Foss
Date: 7/30/19

COMMENTS:
4" Dia. Well set at 39' bgs with 10' Sch. 40 PVC 0.010" slot screen

Depth (ft.)	Well Completion	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
0–2					CL	**SILTY CLAY** TOPSOIL; brown (7.5YR 4/4), soft, moist, some roots.
2–7.5					CL	**SILTY CLAY**; light gray (10YR 7/2), firm to stiff, damp, trace sand, trace iron manganese oxide (FeMnO) staining. **SAA**, with orange F3 oxidation mottling @ 5-7.5'.
7.5–11					CL	**SANDY CLAY**; yellowish brown (10YR 5/6), firm, moist, light gray mottling (10YR 7/2), trace silt.
11–15.5					SC	**CLAYEY SAND**; pale brown (10YR 6/3), loose, moist, trace silt.
15.5–24.5			100% (21–22) 100% (23–24)		SM	**SILTY SAND**; light gray (10YR 7/1), loose to medium dense, saturated. **SILTY SAND**; light brownish gray (10YR 6/2), loose to medium dense, saturated.
24.5–26			100%		CL	**SANDY CLAY**; light yellowish brown (2.5YR 6/3), oft, wet, trace silt.

Continued Next Page

00954596

Drilling Log

Monitoring Well **67WW18**

Project *Longhorn Army Ammunition Plant* Owner *U.S. Army*

Location *LHAAP-67* Proj. No. *501032*

Depth (ft.)	Well Completion	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
						Continued
26			100%		SC	**CLAYEY SAND**; light brownish gray (10YR 6/2) with orange mottles, medium dense, saturated.
28			100%		CL	**SILTY CLAY**; brown (10YR 2/3) with orange mottles, stiff, moist, trace sand.
30			100%			**SANDY CLAY**; light brownish gray (10YR 6/2), stiff, 2-3" light gray sand lenses interbedded, moist, trace silt.
32			100%			
34					SM	**SILTY SAND**; pale brown (10YR 6/3), loose, wet, trace clay.
			100%		CL	**SANDY CLAY**; gray (10YR 6/1), stiff, moist, trace orange mottling.
36			100%		SC	**CLAYEY SAND**; light gray (10YR 7/1), medium dense, saturated, some silt.
38			100%		CL	**SANDY CLAY**; gray (5Y 6/1) with very pale brown (10YR 7/3) mottles, stiff, damp, trace silt, trace FeMnO oxidation.
40			100%			
42						**END OF BORING AT 42 FEET.**
44						
46						
48						
50						
52						
54						
56						
58						
60						

00954597

LONGHORN ARMY AMMUNITION PLANT (LHAAP) - KARNACK, TEXAS

PREPARED FOR APTIM Federal Services, LLC.
2500 CityWest Blvd, Suite 1700
Houston, Texas 77042

	TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE (4202), 1983 NORTH AMERICAN DATUM			
MONITORING WELL	NORTHING	EASTING	NAVD 88 ELEVATION	
	TOP OF CASING	TOP OF CASING	TOP OF CASING	GROUND
04WW06	6959225.38	3305871.99	215.63	212.52
04WW07	6959038.63	3306006.11	214.64	211.66
04WW08	6959148.15	3305963.41	214.82	212.07
04WW09	6959090.67	3305897.71	214.61	211.47
04WW10	6959041.73	3305928.94	213.67	210.40
04WW11	6959032.36	3305839.02	212.01	209.31
17WW19	6952718.36	3315313.67	180.08	176.63
17PZ01	6952783.40	3315662.50	177.22	174.14
17PZ02	6952764.55	3315647.64	177.75	174.57
17PZ03	6952773.35	3115739.59	177.76	174.69
17WW20	6952980.24	3315580.24	180.02	177.13
FLOWLINE CREEK 1	6958236.20	3307772.02	198.47 TOP BANK	191.49 FLOWLINE
FLOWLINE CREEK 2	6958026.38	3308220.92	196.62 TOP BANK	189.16 FLOWLINE
12 WW 10R	6954500.48	3311807.57	203.65	200.16
16 IW 09	6953396.09	3314160.35	181.41	178.08
16 IW 20	6953823.60	3314557.01	188.94	186.03
16 RW 01	6953551.08	3314168.77	189.77	186.56
16 RW 03	6953407.93	3314167.37	181.66	178.32
16 RW 04	6953535.89	3314226.20	190.94	188.04
16 RW 05	6953395.99	3314192.31	180.70	177.61
16 RW 11	6953828.09	3314545.02	189.95	187.46
16 RW 12	6953887.58	3314501.01	196.22	193.23
16 WW 48	6953695.43	3314485.33	184.41	181.46
16 WW 56	6953958.38	3314545.68	198.61	195.35
16 WW 57	6953896.70	3314654.99	177.06	173.12
16 WW 58	6953665.15	3314691.22	177.24	173.32
16IW10	6953780.74	3314013.26	195.90	192.69
16IW27	6953691.80	3314332.92	196.05	193.04
16IW28	6953655.99	3314347.06	189.50	186.62
16IW29	6953590.95	3314379.27	185.89	182.76
16IW30	6953570.27	3314398.21	184.74	181.72
16RW06	6953828.03	3313990.94	197.37	194.35
16RW07	6953785.38	3313988.18	195.48	192.20
16RW08	6953788.82	3314017.82	196.37	193.62
16RW09	6953821.11	3314045.50	197.81	195.14
16RW10	6953763.40	3314053.06	195.25	192.27
16RW25	6953777.99	3314293.02	199.24	196.29
16RW26	6953754.86	3314304.29	198.97	195.66
16WW49	6953750.74	3314402.85	190.69	187.66
16WW51	6953616.52	3314455.29	183.26	180.13
16WW55	6953802.81	3314115.62	194.03	191.11
67WW17	6957124.71	3311329.95	199.73	196.33
67WW18	6957000.55	3311152.49	198.90	195.29
50WW29	6957690.02	3309981.51	195.63	192.18

STATE OF TEXAS
REGISTERED
DAVID R. COLLINS, JR.
6488
PROFESSIONAL
LAND SURVEYOR

DAVID R. COLLINS, JR. R.P.L.S.#6488
SURVEY DATE: OCTOBER 24, 2019

Appendix D

Laboratory Analytical Data Package

(Provided on CD)

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

Client:	Sharon Pennington APTIM 2410 Cherahala Blvd Knoxville, TN 37932 United States	**Phone:** **Fax:**	865-690-3211

Identifier: 008PE **Date Rec:** 05/02/2018 **Report Date:** 05/08/2018

Client Project #: 501032 **Client Project Name:** Longhorn AAP - LHAAP-67

Purchase Order #: 204818

Analysis Requested: Cancelled, CENSUS, Miscellaneous

Reviewed By:

MICROBIAL INSIGHTS, INC.

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

CENSUS

Client:	**APTIM**	**MI Project Number:**	**008PE**
Project:	Longhorn AAP - LHAAP-67	Date Received:	05/02/2018

Sample Information

Client Sample ID:		**67WW13-180501**	**67WW08-180501**
Sample Date:		05/01/2018	05/01/2018
Units:		cells/mL	cells/mL
Analyst/Reviewer:		JS	JS
Dechlorinating Bacteria			
Dehalococcoides	*DHC*	**2.00E-01 (J)**	**2.00E-01 (J)**

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 **5/2/2018**

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	05/02/2018	05/07/2018	0 °C	102%	non-detect	non-detect

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
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December 03, 2018

Kim Napier
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18101278**

Laboratory Results for: **LHAAP-67**

Dear Kim,

ALS Environmental received 10 sample(s) on Oct 24, 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: JUMOKE.LAWAL

RJ Modashia
Project Manager

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
Work Order: HS18101278

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18101278-01	67WW14-181022	Groundwater		22-Oct-2018 12:55	24-Oct-2018 08:55	☐
HS18101278-02	67WW12-181022	Groundwater		22-Oct-2018 13:45	24-Oct-2018 08:55	☐
HS18101278-03	67WW10-181022	Groundwater		22-Oct-2018 14:35	24-Oct-2018 08:55	☐
HS18101278-04	67WW13-181023	Groundwater		23-Oct-2018 09:35	24-Oct-2018 08:55	☐
HS18101278-05	67WW08-181023	Groundwater		23-Oct-2018 10:45	24-Oct-2018 08:55	☐
HS18101278-06	67WW08-181023-FD	Groundwater		23-Oct-2018 10:45	24-Oct-2018 08:55	☐
HS18101278-07	67WW11-181023	Groundwater		23-Oct-2018 11:55	24-Oct-2018 08:55	☐
HS18101278-08	67WW09-181023	Groundwater		23-Oct-2018 12:45	24-Oct-2018 08:55	☐
HS18101278-09	67WW15-181023	Groundwater		23-Oct-2018 13:35	24-Oct-2018 08:55	☐
HS18101278-10	Trip Blank	Water	ALS 071918-84	23-Oct-2018 00:00	24-Oct-2018 08:55	☑

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.

Project: LHAAP-67

Work Order:

CASE NARRATIVE

Work Order Comments

- The analysis for Methane, Methene, Ethane and CO2 by RSK175 was subcontracted to ALS Simi Valley, CA. Final report attached.

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.

GCMS Volatiles by Method SW8260

Batch ID: R326371

Sample ID: 67WW14-181022 (HS18101278-01MS)

- The recovery of the Matrix Spike (MS) associated to this analyte was outside of the established control limits. However, the LCS was within control limits. The recovery of the MS may be due to sample matrix interference.

Sample ID: 67WW14-181022 (HS18101278-01MSD)

- The recovery of the Matrix Spike Duplicate (MSD) associated to this analyte was outside of the established control limits. However, the LCS was within control limits. The failed recovery of the MSD may be due to sample matrix interference.

Wet Chemistry by Method SW9056

Batch ID: R326431

Sample ID: HS18101236-18MSD

- MSD is for an unrelated sample.

Wet Chemistry by Method E376.1

Batch ID: R326270

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

WetChemistry by Method SM2320B

Batch ID: R326282

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

WetChemistry by Method SM3500FED

Batch ID: R326268

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW14-181022		Lab ID:HS18101278-01
Collection Date:	22-Oct-2018 12:55		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,1-Dichloroethane	**1.3**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 13:33
1,1-Dichloroethene	**6.6**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 13:33
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 13:33
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,2-Dichloroethane	**2.5**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 13:33
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 13:33
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 13:33
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 13:33
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 13:33
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 13:33
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33

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

ALS Houston, US Date: 03-Dec-18

ANALYTICAL REPORT

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
Sample ID: 67WW14-181022
Collection Date: 22-Oct-2018 12:55

WorkOrder:HS18101278
Lab ID:HS18101278-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 13:33
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 13:33
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 13:33
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 13:33
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 13:33
Surr: 1,2-Dichloroethane-d4	*93.8*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 13:33*
Surr: 4-Bromofluorobenzene	*100*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 13:33*
Surr: Dibromofluoromethane	*96.9*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 13:33*
Surr: Toluene-d8	*94.2*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 13:33*

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67	WorkOrder:	HS18101278
Sample ID:	67WW12-181022	Lab ID:	HS18101278-02
Collection Date:	22-Oct-2018 13:45	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,1-Dichloroethene	**4.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 15:11
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 15:11
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 15:11
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 15:11
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 15:11
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 15:11
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 15:11
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.	ANALYTICAL REPORT
Project:	LHAAP-67	WorkOrder:HS18101278
Sample ID:	67WW12-181022	Lab ID:HS18101278-02
Collection Date:	22-Oct-2018 13:45	Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 15:11
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 15:11
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 15:11
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:11
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:11
Surr: 1,2-Dichloroethane-d4	*97.0*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 15:11*
Surr: 4-Bromofluorobenzene	*99.6*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 15:11*
Surr: Dibromofluoromethane	*97.1*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 15:11*
Surr: Toluene-d8	*93.1*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 15:11*

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW10-181022		Lab ID:HS18101278-03
Collection Date:	22-Oct-2018 14:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 15:35
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 15:35
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 15:35
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 15:35
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 15:35
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 15:35
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW10-181022		Lab ID:HS18101278-03
Collection Date:	22-Oct-2018 14:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 15:35
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 15:35
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 15:35
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 15:35
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 15:35
Surr: 1,2-Dichloroethane-d4	*95.8*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 15:35*
Surr: 4-Bromofluorobenzene	*99.2*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 15:35*
Surr: Dibromofluoromethane	*98.7*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 15:35*
Surr: Toluene-d8	*93.1*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 15:35*

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW13-181023		Lab ID:HS18101278-04
Collection Date:	23-Oct-2018 09:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,1,2-Trichloroethane	**6.1**		**0.30**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:04
1,1-Dichloroethane	**32**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:04
1,1-Dichloroethene	**570**		**2.0**	**5.0**	**10**	**ug/L**	10	28-Oct-2018 20:31
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 20:04
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,2-Dichloroethane	**43**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:04
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 20:04
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 20:04
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 20:04
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 20:04
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 20:04
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW13-181023		Lab ID:HS18101278-04
Collection Date:	23-Oct-2018 09:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	**1.4**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:04
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
cis-1,2-Dichloroethene	**1.9**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:04
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 20:04
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 20:04
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 20:04
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:04
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Trichloroethene	**2.4**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:04
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:04
Surr: 1,2-Dichloroethane-d4	*94.6*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 20:04*
Surr: 1,2-Dichloroethane-d4	*95.7*			**0**	*70-126*	*%REC*	*10*	*28-Oct-2018 20:31*
Surr: 4-Bromofluorobenzene	*99.6*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 20:04*
Surr: 4-Bromofluorobenzene	*100*			**0**	*81-113*	*%REC*	*10*	*28-Oct-2018 20:31*
Surr: Dibromofluoromethane	*95.2*			**0**	*77-123*	*%REC*	*10*	*28-Oct-2018 20:31*
Surr: Dibromofluoromethane	*95.5*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 20:04*
Surr: Toluene-d8	*93.3*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 20:04*
Surr: Toluene-d8	*93.9*			**0**	*82-127*	*%REC*	*10*	*28-Oct-2018 20:31*
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	**2.28**		**1.00**	**1.00**	**1.00**	**mg/L**	1	27-Oct-2018 14:00
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**368**		**5.00**	**5.00**	**5.00**	**mg/L**	1	27-Oct-2018 18:10

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.	ANALYTICAL REPORT
Project:	LHAAP-67	WorkOrder:HS18101278
Sample ID:	67WW13-181023	Lab ID:HS18101278-04
Collection Date:	23-Oct-2018 09:35	Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
FERROUS IRON BY SM3500 FE D		**Method:SM3500FED**						Analyst: MZD
Ferrous Iron	**0.0350**	Jn	**0.0200**	**0.0500**	**0.0500**	**mg/L**	1	24-Oct-2018 10:44
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**1,420**		**4.00**	**10.0**	**10.0**	**mg/L**	20	24-Oct-2018 21:32
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	24-Oct-2018 21:18
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	24-Oct-2018 21:18
Sulfate	**355**		**4.00**	**10.0**	**10.0**	**mg/L**	20	24-Oct-2018 21:32
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0			1	31-Oct-2018 16:29
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	30-Nov-2018 19:57
SUBCONTRACTED ANALYSIS		**Method:NA**						Analyst: SUBK
Miscellaneous Analysis	See Attached		0	0		NA	1	30-Nov-2018 19:57

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW08-181023		Lab ID:HS18101278-05
Collection Date:	23-Oct-2018 10:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,1-Dichloroethane	**12**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:00
1,1-Dichloroethene	**160**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:00
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 16:00
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,2-Dichloroethane	**6.5**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:00
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 16:00
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 16:00
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 16:00
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 16:00
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 16:00
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW08-181023		Lab ID:HS18101278-05
Collection Date:	23-Oct-2018 10:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 16:00
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 16:00
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 16:00
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:00
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:00
Surr: 1,2-Dichloroethane-d4	*95.0*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 16:00*
Surr: 4-Bromofluorobenzene	*98.9*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 16:00*
Surr: Dibromofluoromethane	*97.1*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 16:00*
Surr: Toluene-d8	*92.1*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 16:00*
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	27-Oct-2018 14:00
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**220**		**5.00**	**5.00**	**5.00**	**mg/L**	1	27-Oct-2018 18:16
FERROUS IRON BY SM3500 FE D		**Method:SM3500FED**						Analyst: MZD
Ferrous Iron	**0.343**	n	**0.0200**	**0.0500**	**0.0500**	**mg/L**	1	24-Oct-2018 10:44

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW08-181023		Lab ID:HS18101278-05
Collection Date:	23-Oct-2018 10:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		Method:SW9056						Analyst: KMU
Chloride	**1,820**		**4.00**	**10.0**	**10.0**	**mg/L**	20	24-Oct-2018 22:02
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	24-Oct-2018 21:47
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	24-Oct-2018 21:47
Sulfate	**499**		**4.00**	**10.0**	**10.0**	**mg/L**	20	24-Oct-2018 22:02
SUBCONTRACT ANALYSIS - RSK		Method:NA						Analyst: SUB
Subcontract Analysis	See Attached		0	0			1	31-Oct-2018 16:29
SUBCONTRACT ANALYSIS - TOC ANALYSIS		Method:NA						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	30-Nov-2018 19:57
SUBCONTRACTED ANALYSIS		Method:NA						Analyst: SUBK
Miscellaneous Analysis	See Attached		0	0		NA	1	30-Nov-2018 19:57

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67	WorkOrder:	HS18101278
Sample ID:	67WW08-181023-FD	Lab ID:	HS18101278-06
Collection Date:	23-Oct-2018 10:45	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,1-Dichloroethane	**12**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:24
1,1-Dichloroethene	**160**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:24
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 16:24
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,2-Dichloroethane	**6.2**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:24
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 16:24
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 16:24
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 16:24
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 16:24
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 16:24
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW08-181023-FD		Lab ID:HS18101278-06
Collection Date:	23-Oct-2018 10:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 16:24
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 16:24
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 16:24
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:24
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:24
Surr: 1,2-Dichloroethane-d4	*97.7*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 16:24*
Surr: 4-Bromofluorobenzene	*99.0*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 16:24*
Surr: Dibromofluoromethane	*96.1*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 16:24*
Surr: Toluene-d8	*92.8*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 16:24*
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	27-Oct-2018 14:00
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**221**		**5.00**	**5.00**	**5.00**	**mg/L**	1	27-Oct-2018 18:22
FERROUS IRON BY SM3500 FE D		**Method:SM3500FED**						Analyst: MZD
Ferrous Iron	**0.270**	n	**0.0200**	**0.0500**	**0.0500**	**mg/L**	1	24-Oct-2018 10:44

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW08-181023-FD		Lab ID:HS18101278-06
Collection Date:	23-Oct-2018 10:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**1,770**		**4.00**	**10.0**	**10.0**	**mg/L**	20	24-Oct-2018 22:31
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	24-Oct-2018 22:16
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	24-Oct-2018 22:16
Sulfate	**489**		**4.00**	**10.0**	**10.0**	**mg/L**	20	24-Oct-2018 22:31
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0			1	31-Oct-2018 16:29
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	30-Nov-2018 19:57
SUBCONTRACTED ANALYSIS		**Method:NA**						Analyst: SUBK
Miscellaneous Analysis	See Attached		0	0		NA	1	30-Nov-2018 19:57

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW11-181023		Lab ID:HS18101278-07
Collection Date:	23-Oct-2018 11:55		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,1-Dichloroethane	**3.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:48
1,1-Dichloroethene	**6.1**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 16:48
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 16:48
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 16:48
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 16:48
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 16:48
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 16:48
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 16:48
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW11-181023		Lab ID:HS18101278-07
Collection Date:	23-Oct-2018 11:55		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 16:48
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 16:48
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 16:48
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 16:48
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 16:48
Surr: 1,2-Dichloroethane-d4	*96.3*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 16:48*
Surr: 4-Bromofluorobenzene	*98.4*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 16:48*
Surr: Dibromofluoromethane	*98.3*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 16:48*
Surr: Toluene-d8	*92.4*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 16:48*

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW09-181023		Lab ID:HS18101278-08
Collection Date:	23-Oct-2018 12:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 17:13
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 17:13
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 17:13
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 17:13
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 17:13
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 17:13
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW09-181023		Lab ID:HS18101278-08
Collection Date:	23-Oct-2018 12:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 17:13
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 17:13
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 17:13
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 17:13
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 17:13
Surr: 1,2-Dichloroethane-d4	*96.5*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 17:13*
Surr: 4-Bromofluorobenzene	*98.1*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 17:13*
Surr: Dibromofluoromethane	*97.5*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 17:13*
Surr: Toluene-d8	*92.6*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 17:13*

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW15-181023		Lab ID:HS18101278-09
Collection Date:	23-Oct-2018 13:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,1,2-Trichloroethane	**6.0**		**0.30**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:56
1,1-Dichloroethane	**13**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:56
1,1-Dichloroethene	**670**		**2.0**	**5.0**	**10**	**ug/L**	10	28-Oct-2018 21:23
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 20:56
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,2-Dichloroethane	**30**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:56
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 20:56
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 20:56
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	28-Oct-2018 20:56
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	28-Oct-2018 20:56
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	28-Oct-2018 20:56
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56

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

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-67		WorkOrder:HS18101278
Sample ID:	67WW15-181023		Lab ID:HS18101278-09
Collection Date:	23-Oct-2018 13:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
cis-1,2-Dichloroethene	**1.7**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:56
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	28-Oct-2018 20:56
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	28-Oct-2018 20:56
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	28-Oct-2018 20:56
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	28-Oct-2018 20:56
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Trichloroethene	**1.4**		**0.20**	**0.50**	**1.0**	**ug/L**	1	28-Oct-2018 20:56
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	28-Oct-2018 20:56
Surr: 1,2-Dichloroethane-d4	*94.7*			**0**	*70-126*	*%REC*	*10*	*28-Oct-2018 21:23*
Surr: 1,2-Dichloroethane-d4	*98.2*			**0**	*70-126*	*%REC*	*1*	*28-Oct-2018 20:56*
Surr: 4-Bromofluorobenzene	*101*			**0**	*81-113*	*%REC*	*1*	*28-Oct-2018 20:56*
Surr: 4-Bromofluorobenzene	*99.4*			**0**	*81-113*	*%REC*	*10*	*28-Oct-2018 21:23*
Surr: Dibromofluoromethane	*97.0*			**0**	*77-123*	*%REC*	*10*	*28-Oct-2018 21:23*
Surr: Dibromofluoromethane	*98.8*			**0**	*77-123*	*%REC*	*1*	*28-Oct-2018 20:56*
Surr: Toluene-d8	*93.1*			**0**	*82-127*	*%REC*	*1*	*28-Oct-2018 20:56*
Surr: Toluene-d8	*91.0*			**0**	*82-127*	*%REC*	*10*	*28-Oct-2018 21:23*

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

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R326268	**Test Name :** FERROUS IRON BY SM3500 FE D			**Matrix:** Groundwater		
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			24 Oct 2018 10:44	1
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			24 Oct 2018 10:44	1
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			24 Oct 2018 10:44	1
Batch ID R326270	**Test Name :** SULFIDE BY E376.1			**Matrix:** Groundwater		
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			27 Oct 2018 14:00	1
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			27 Oct 2018 14:00	1
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			27 Oct 2018 14:00	1
Batch ID R326282	**Test Name :** ALKALINITY BY SM2320B			**Matrix:** Groundwater		
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			27 Oct 2018 18:10	1
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			27 Oct 2018 18:16	1
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			27 Oct 2018 18:22	1
Batch ID R326371	**Test Name :** LOW LEVEL VOLATILES BY SW8260C			**Matrix:** Groundwater		
HS18101278-01	67WW14-181022	22 Oct 2018 12:55			28 Oct 2018 13:33	1
HS18101278-02	67WW12-181022	22 Oct 2018 13:45			28 Oct 2018 15:11	1
HS18101278-03	67WW10-181022	22 Oct 2018 14:35			28 Oct 2018 15:35	1
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			28 Oct 2018 20:31	10
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			28 Oct 2018 20:04	1
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			28 Oct 2018 16:00	1
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			28 Oct 2018 16:24	1
HS18101278-07	67WW11-181023	23 Oct 2018 11:55			28 Oct 2018 16:48	1
HS18101278-08	67WW09-181023	23 Oct 2018 12:45			28 Oct 2018 17:13	1
HS18101278-09	67WW15-181023	23 Oct 2018 13:35			28 Oct 2018 21:23	10
HS18101278-09	67WW15-181023	23 Oct 2018 13:35			28 Oct 2018 20:56	1
Batch ID R326431	**Test Name :** ANIONS BY SW9056A			**Matrix:** Groundwater		
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			24 Oct 2018 21:32	20
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			24 Oct 2018 21:18	2
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			24 Oct 2018 22:02	20
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			24 Oct 2018 21:47	2
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			24 Oct 2018 22:31	20
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			24 Oct 2018 22:16	2
Batch ID R326554	**Test Name :** SUBCONTRACT ANALYSIS - RSK			**Matrix:** Groundwater		
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			31 Oct 2018 16:29	1
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			31 Oct 2018 16:29	1
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			31 Oct 2018 16:29	1

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R328436	**Test Name :** SUBCONTRACTED ANALYSIS			**Matrix:** Groundwater		
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			30 Nov 2018 19:57	1
HS18101278-04	67WW13-181023	23 Oct 2018 09:35			30 Nov 2018 19:57	1
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			30 Nov 2018 19:57	1
HS18101278-05	67WW08-181023	23 Oct 2018 10:45			30 Nov 2018 19:57	1
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			30 Nov 2018 19:57	1
HS18101278-06	67WW08-181023-FD	23 Oct 2018 10:45			30 Nov 2018 19:57	1

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

MBLK Sample ID: **VBLKW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 12:44**

Client ID: Run ID: **VOA2_326371** SeqNo: **4795123** 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-Trichlor-1,2,2-trifluoroethane	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	1.0	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	2.0	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

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

MBLK Sample ID: **VBLKW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 12:44**
Client ID: Run ID: **VOA2_326371** SeqNo: **4795123** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	0.50	1.0								U
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	1.0	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	*47.49*	*1.0*	*50*	*0*	*95.0*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.34*	*1.0*	*50*	*0*	*98.7*	*82 - 115*				
Surr: Dibromofluoromethane	*48.3*	*1.0*	*50*	*0*	*96.6*	*73 - 126*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: **R326371** **Instrument:** **VOA2** **Method:** **SW8260**

MBLK Sample ID: **VBLKW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 12:44**

Client ID: Run ID: **VOA2_326371** SeqNo: **4795123** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.74*	*1.0*	*50*	*0*	*91.5*	*81 - 120*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: **R326371** **Instrument:** **VOA2** **Method:** **SW8260**

LCS Sample ID: **VLCSW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 11:55**
Client ID: Run ID: **VOA2_326371** SeqNo: **4795121** 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	20.28	1.0	20	0	101	77 - 118				
1,1,1-Trichloroethane	19.78	1.0	20	0	98.9	70 - 130				
1,1,2,2-Tetrachloroethane	17.71	1.0	20	0	88.5	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	24.98	1.0	20	0	125	70 - 130				
1,1,2-Trichloroethane	20.01	1.0	20	0	100	77 - 113				
1,1-Dichloroethane	20.55	1.0	20	0	103	71 - 122				
1,1-Dichloroethene	20.68	1.0	20	0	103	70 - 130				
1,1-Dichloropropene	22.76	1.0	20	0	114	78 - 118				
1,2,3-Trichlorobenzene	17.82	1.0	20	0	89.1	70 - 130				
1,2,3-Trichloropropane	17.75	1.0	20	0	88.7	70 - 127				
1,2,4-Trichlorobenzene	19.12	1.0	20	0	95.6	77 - 126				
1,2,4-Trimethylbenzene	20.82	1.0	20	0	104	73 - 121				
1,2-Dibromo-3-chloropropane	17.12	1.0	20	0	85.6	70 - 130				
1,2-Dibromoethane	20.55	1.0	20	0	103	76 - 123				
1,2-Dichlorobenzene	19.11	1.0	20	0	95.5	77 - 113				
1,2-Dichloroethane	21.11	1.0	20	0	106	70 - 124				
1,2-Dichloropropane	21.81	1.0	20	0	109	72 - 119				
1,3,5-Trimethylbenzene	18.88	1.0	20	0	94.4	75 - 118				
1,3-Dichlorobenzene	19.79	1.0	20	0	99.0	78 - 118				
1,3-Dichloropropane	20.5	1.0	20	0	102	75 - 116				
1,4-Dichlorobenzene	19.52	1.0	20	0	97.6	79 - 113				
2,2-Dichloropropane	23.92	1.0	20	0	120	70 - 130				
2-Butanone	39.93	2.0	40	0	99.8	70 - 130				
2-Chlorotoluene	20.95	1.0	20	0	105	70 - 128				
2-Hexanone	39.52	2.0	40	0	98.8	70 - 130				
4-Chlorotoluene	21.45	1.0	20	0	107	74 - 126				
4-Isopropyltoluene	18.25	1.0	20	0	91.2	74 - 126				
4-Methyl-2-pentanone	39.74	2.0	40	0	99.4	70 - 130				
Acetone	36.05	2.0	40	0	90.1	70 - 130				
Benzene	20.64	1.0	20	0	103	74 - 120				
Bromobenzene	19.01	1.0	20	0	95.0	78 - 113				
Bromochloromethane	20.83	1.0	20	0	104	76 - 124				
Bromodichloromethane	20.91	1.0	20	0	105	74 - 122				
Bromoform	19.62	1.0	20	0	98.1	73 - 128				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

LCS Sample ID: **VLCSW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 11:55**
Client ID: Run ID: **VOA2_326371** SeqNo: **4795121** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	25.33	1.0	20	0	127	70 - 130				
Carbon disulfide	40.66	2.0	40	0	102	70 - 130				
Carbon tetrachloride	21.88	1.0	20	0	109	71 - 125				
Chlorobenzene	20.95	1.0	20	0	105	76 - 113				
Chloroethane	21.5	1.0	20	0	108	70 - 130				
Chloroform	19.86	1.0	20	0	99.3	71 - 121				
Chloromethane	20.19	1.0	20	0	101	70 - 129				
cis-1,2-Dichloroethene	20.84	1.0	20	0	104	75 - 122				
cis-1,3-Dichloropropene	22.81	1.0	20	0	114	73 - 127				
Dibromochloromethane	19.69	1.0	20	0	98.5	77 - 122				
Dibromomethane	21.53	1.0	20	0	108	78 - 121				
Dichlorodifluoromethane	23.69	1.0	20	0	118	70 - 130				
Ethylbenzene	22.67	1.0	20	0	113	77 - 117				
Hexachlorobutadiene	19.95	1.0	20	0	99.8	70 - 130				
Isopropylbenzene	20.23	1.0	20	0	101	73 - 127				
m,p-Xylene	45.94	2.0	40	0	115	77 - 122				
Methylene chloride	20.47	2.0	20	0	102	70 - 127				
Naphthalene	16.57	1.0	20	0	82.8	70 - 130				
n-Butylbenzene	20.88	1.0	20	0	104	72 - 130				
n-Propylbenzene	21.57	1.0	20	0	108	73 - 124				
o-Xylene	21.9	1.0	20	0	110	75 - 119				
sec-Butylbenzene	18.79	1.0	20	0	93.9	73 - 128				
Styrene	20.93	1.0	20	0	105	72 - 126				
tert-Butylbenzene	21.09	1.0	20	0	105	73 - 124				
Tetrachloroethene	20.81	1.0	20	0	104	76 - 119				
Toluene	20.24	1.0	20	0	101	77 - 118				
trans-1,2-Dichloroethene	21.33	1.0	20	0	107	72 - 127				
trans-1,3-Dichloropropene	23.63	1.0	20	0	118	77 - 119				
Trichloroethene	20.26	1.0	20	0	101	77 - 121				
Trichlorofluoromethane	22.99	1.0	20	0	115	70 - 130				
Vinyl chloride	22.49	1.0	20	0	112	70 - 130				
Surr: 1,2-Dichloroethane-d4	*51.13*	*1.0*	*50*	*0*	*102*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*52.11*	*1.0*	*50*	*0*	*104*	*82 - 115*				
Surr: Dibromofluoromethane	*48.64*	*1.0*	*50*	*0*	*97.3*	*73 - 126*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: **R326371** **Instrument:** **VOA2** **Method:** **SW8260**

LCS Sample ID: **VLCSW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 11:55**
Client ID: Run ID: **VOA2_326371** SeqNo: **4795121** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.43*	*1.0*	*50*	*0*	*90.9*	*81 - 120*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

LCS Sample ID: **VLCSW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 12:19**
Client ID: Run ID: **VOA2_326371** SeqNo: **4795122** 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	20.2	1.0	20	0	101	77 - 118				
1,1,1-Trichloroethane	18.92	1.0	20	0	94.6	70 - 130				
1,1,2,2-Tetrachloroethane	18.42	1.0	20	0	92.1	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.84	1.0	20	0	114	70 - 130				
1,1,2-Trichloroethane	20.19	1.0	20	0	101	77 - 113				
1,1-Dichloroethane	19.82	1.0	20	0	99.1	71 - 122				
1,1-Dichloroethene	20.12	1.0	20	0	101	70 - 130				
1,1-Dichloropropene	21.63	1.0	20	0	108	78 - 118				
1,2,3-Trichlorobenzene	18.28	1.0	20	0	91.4	70 - 130				
1,2,3-Trichloropropane	18.65	1.0	20	0	93.2	70 - 127				
1,2,4-Trichlorobenzene	19.58	1.0	20	0	97.9	77 - 126				
1,2,4-Trimethylbenzene	20.46	1.0	20	0	102	73 - 121				
1,2-Dibromo-3-chloropropane	17.42	1.0	20	0	87.1	70 - 130				
1,2-Dibromoethane	21.21	1.0	20	0	106	76 - 123				
1,2-Dichlorobenzene	19.06	1.0	20	0	95.3	77 - 113				
1,2-Dichloroethane	21.27	1.0	20	0	106	70 - 124				
1,2-Dichloropropane	21.75	1.0	20	0	109	72 - 119				
1,3,5-Trimethylbenzene	18.72	1.0	20	0	93.6	75 - 118				
1,3-Dichlorobenzene	19.66	1.0	20	0	98.3	78 - 118				
1,3-Dichloropropane	20.6	1.0	20	0	103	75 - 116				
1,4-Dichlorobenzene	20.22	1.0	20	0	101	79 - 113				
2,2-Dichloropropane	22.25	1.0	20	0	111	70 - 130				
2-Butanone	41.44	2.0	40	0	104	70 - 130				
2-Chlorotoluene	20.8	1.0	20	0	104	70 - 128				
2-Hexanone	41.46	2.0	40	0	104	70 - 130				
4-Chlorotoluene	21.17	1.0	20	0	106	74 - 126				
4-Isopropyltoluene	17.9	1.0	20	0	89.5	74 - 126				
4-Methyl-2-pentanone	41.92	2.0	40	0	105	70 - 130				
Acetone	39.22	2.0	40	0	98.1	70 - 130				
Benzene	20.15	1.0	20	0	101	74 - 120				
Bromobenzene	19	1.0	20	0	95.0	78 - 113				
Bromochloromethane	20.18	1.0	20	0	101	76 - 124				
Bromodichloromethane	21.11	1.0	20	0	106	74 - 122				
Bromoform	19.76	1.0	20	0	98.8	73 - 128				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: **R326371** **Instrument:** **VOA2** **Method:** **SW8260**

LCS Sample ID: **VLCSW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 12:19**
Client ID: Run ID: **VOA2_326371** SeqNo: **4795122** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	22.19	1.0	20	0	111	70 - 130				
Carbon disulfide	37.79	2.0	40	0	94.5	70 - 130				
Carbon tetrachloride	20.25	1.0	20	0	101	71 - 125				
Chlorobenzene	20.5	1.0	20	0	102	76 - 113				
Chloroethane	20.06	1.0	20	0	100	70 - 130				
Chloroform	19.26	1.0	20	0	96.3	71 - 121				
Chloromethane	19.64	1.0	20	0	98.2	70 - 129				
cis-1,2-Dichloroethene	20.07	1.0	20	0	100	75 - 122				
cis-1,3-Dichloropropene	22.66	1.0	20	0	113	73 - 127				
Dibromochloromethane	20.17	1.0	20	0	101	77 - 122				
Dibromomethane	21.29	1.0	20	0	106	78 - 121				
Dichlorodifluoromethane	21.55	1.0	20	0	108	70 - 130				
Ethylbenzene	22	1.0	20	0	110	77 - 117				
Hexachlorobutadiene	19.67	1.0	20	0	98.3	70 - 130				
Isopropylbenzene	19.53	1.0	20	0	97.6	73 - 127				
m,p-Xylene	44.79	2.0	40	0	112	77 - 122				
Methylene chloride	20.25	2.0	20	0	101	70 - 127				
Naphthalene	18.02	1.0	20	0	90.1	70 - 130				
n-Butylbenzene	20.37	1.0	20	0	102	72 - 130				
n-Propylbenzene	21	1.0	20	0	105	73 - 124				
o-Xylene	22.01	1.0	20	0	110	75 - 119				
sec-Butylbenzene	18.44	1.0	20	0	92.2	73 - 128				
Styrene	20.69	1.0	20	0	103	72 - 126				
tert-Butylbenzene	20.21	1.0	20	0	101	73 - 124				
Tetrachloroethene	20.07	1.0	20	0	100	76 - 119				
Toluene	19.73	1.0	20	0	98.6	77 - 118				
trans-1,2-Dichloroethene	20.37	1.0	20	0	102	72 - 127				
trans-1,3-Dichloropropene	23.6	1.0	20	0	118	77 - 119				
Trichloroethene	19.99	1.0	20	0	100.0	77 - 121				
Trichlorofluoromethane	21.03	1.0	20	0	105	70 - 130				
Vinyl chloride	20.87	1.0	20	0	104	70 - 130				
Surr: 1,2-Dichloroethane-d4	*49.12*	*1.0*	*50*	*0*	*98.2*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*52.09*	*1.0*	*50*	*0*	*104*	*82 - 115*				
Surr: Dibromofluoromethane	*48.3*	*1.0*	*50*	*0*	*96.6*	*73 - 126*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: **R326371** **Instrument:** **VOA2** **Method:** **SW8260**

LCS Sample ID: **VLCSW-181028** Units: **ug/L** Analysis Date: **28-Oct-2018 12:19**
Client ID: Run ID: **VOA2_326371** SeqNo: **4795122** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.03*	*1.0*	*50*	*0*	*90.1*	*81 - 120*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

MS Sample ID: **HS18101278-01MS** Units: **ug/L** Analysis Date: **28-Oct-2018 13:57**
Client ID: **67WW14-181022** Run ID: **VOA2_326371** SeqNo: **4795126** 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	18.55	1.0	20	0	92.7	70 - 120				
1,1,1-Trichloroethane	18.37	1.0	20	0	91.9	70 - 130				
1,1,2,2-Tetrachloroethane	15.9	1.0	20	0	79.5	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	20.31	1.0	20	0	102	70 - 130				
1,1,2-Trichloroethane	18.29	1.0	20	0	91.5	70 - 117				
1,1-Dichloroethane	20.26	1.0	20	1.269	94.9	70 - 127				
1,1-Dichloroethene	25.72	1.0	20	6.577	95.7	70 - 130				
1,1-Dichloropropene	21.15	1.0	20	0	106	70 - 129				
1,2,3-Trichlorobenzene	15.4	1.0	20	0	77.0	70 - 130				
1,2,3-Trichloropropane	16	1.0	20	0	80.0	70 - 130				
1,2,4-Trichlorobenzene	16.44	1.0	20	0	82.2	70 - 125				
1,2,4-Trimethylbenzene	18.54	1.0	20	0	92.7	70 - 125				
1,2-Dibromo-3-chloropropane	15.26	1.0	20	0	76.3	70 - 130				
1,2-Dibromoethane	18.38	1.0	20	0	91.9	70 - 124				
1,2-Dichlorobenzene	17.35	1.0	20	0	86.7	70 - 115				
1,2-Dichloroethane	22.04	1.0	20	2.545	97.5	70 - 127				
1,2-Dichloropropane	19.62	1.0	20	0	98.1	70 - 122				
1,3,5-Trimethylbenzene	17.16	1.0	20	0	85.8	70 - 126				
1,3-Dichlorobenzene	17.75	1.0	20	0	88.7	70 - 119				
1,3-Dichloropropane	18.26	1.0	20	0	91.3	70 - 121				
1,4-Dichlorobenzene	17.48	1.0	20	0	87.4	70 - 114				
2,2-Dichloropropane	21.28	1.0	20	0	106	70 - 130				
2-Butanone	34.4	2.0	40	0	86.0	70 - 130				
2-Chlorotoluene	19.37	1.0	20	0	96.8	70 - 130				
2-Hexanone	34.34	2.0	40	0	85.8	70 - 130				
4-Chlorotoluene	19.44	1.0	20	0	97.2	70 - 130				
4-Isopropyltoluene	16.73	1.0	20	0	83.7	70 - 130				
4-Methyl-2-pentanone	35.01	2.0	40	0	87.5	70 - 130				
Acetone	31.8	2.0	40	0	79.5	70 - 130				
Benzene	18.66	1.0	20	0	93.3	70 - 127				
Bromobenzene	17.41	1.0	20	0	87.1	70 - 115				
Bromochloromethane	18.83	1.0	20	0	94.1	70 - 127				
Bromodichloromethane	19.09	1.0	20	0	95.5	70 - 124				
Bromoform	16.88	1.0	20	0	84.4	70 - 129				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

MS Sample ID: **HS18101278-01MS** Units: **ug/L** Analysis Date: **28-Oct-2018 13:57**
Client ID: **67WW14-181022** Run ID: **VOA2_326371** SeqNo: **4795126** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	19.49	1.0	20	0	97.4	70 - 130				
Carbon disulfide	35.99	2.0	40	0	90.0	70 - 130				
Carbon tetrachloride	19.53	1.0	20	0	97.7	70 - 130				
Chlorobenzene	18.58	1.0	20	0	92.9	70 - 114				
Chloroethane	18.43	1.0	20	0	92.1	70 - 130				
Chloroform	18.41	1.0	20	0	92.0	70 - 125				
Chloromethane	14.47	1.0	20	0	72.4	70 - 130				
cis-1,2-Dichloroethene	18.88	1.0	20	0	94.4	70 - 128				
cis-1,3-Dichloropropene	20.19	1.0	20	0	101	70 - 125				
Dibromochloromethane	17.77	1.0	20	0	88.9	70 - 124				
Dibromomethane	18.73	1.0	20	0	93.7	70 - 124				
Dichlorodifluoromethane	10.34	1.0	20	0	51.7	70 - 130				S
Ethylbenzene	19.97	1.0	20	0	99.9	70 - 124				
Hexachlorobutadiene	18.31	1.0	20	0	91.5	70 - 130				
Isopropylbenzene	18.48	1.0	20	0	92.4	70 - 130				
m,p-Xylene	40.12	2.0	40	0	100	70 - 130				
Methylene chloride	18.66	2.0	20	0	93.3	70 - 128				
Naphthalene	13.59	1.0	20	0	67.9	70 - 130				S
n-Butylbenzene	18.86	1.0	20	0	94.3	70 - 130				
n-Propylbenzene	19.5	1.0	20	0	97.5	70 - 130				
o-Xylene	19.53	1.0	20	0	97.7	70 - 124				
sec-Butylbenzene	17.4	1.0	20	0	87.0	70 - 130				
Styrene	17.31	1.0	20	0	86.5	70 - 130				
tert-Butylbenzene	19.09	1.0	20	0	95.5	70 - 130				
Tetrachloroethene	18.83	1.0	20	0	94.2	70 - 130				
Toluene	18.42	1.0	20	0	92.1	70 - 123				
trans-1,2-Dichloroethene	19	1.0	20	0	95.0	70 - 130				
trans-1,3-Dichloropropene	19.92	1.0	20	0	99.6	70 - 121				
Trichloroethene	18.73	1.0	20	0	93.7	70 - 129				
Trichlorofluoromethane	18.77	1.0	20	0	93.9	70 - 130				
Vinyl chloride	17.23	1.0	20	0	86.2	70 - 130				
Surr: 1,2-Dichloroethane-d4	*49.41*	*1.0*	*50*	*0*	*98.8*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.13*	*1.0*	*50*	*0*	*102*	*81 - 113*				
Surr: Dibromofluoromethane	*49.09*	*1.0*	*50*	*0*	*98.2*	*77 - 123*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: **R326371** **Instrument:** **VOA2** **Method:** **SW8260**

MS Sample ID: **HS18101278-01MS** Units: **ug/L** Analysis Date: **28-Oct-2018 13:57**
Client ID: **67WW14-181022** Run ID: **VOA2_326371** SeqNo: **4795126** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.32*	*1.0*	*50*	*0*	*90.6*	*82 - 127*				

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

MSD Sample ID: **HS18101278-01MSD** Units: **ug/L** Analysis Date: **28-Oct-2018 14:22**
Client ID: **67WW14-181022** Run ID: **VOA2_326371** SeqNo: **4795127** 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	18.04	1.0	20	0	90.2	70 - 120	18.55	2.78	20	
1,1,1-Trichloroethane	17.6	1.0	20	0	88.0	70 - 130	18.37	4.29	20	
1,1,2,2-Tetrachloroethane	16.37	1.0	20	0	81.9	70 - 123	15.9	2.94	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	18.84	1.0	20	0	94.2	70 - 130	20.31	7.54	20	
1,1,2-Trichloroethane	18.08	1.0	20	0	90.4	70 - 117	18.29	1.18	20	
1,1-Dichloroethane	19.53	1.0	20	1.269	91.3	70 - 127	20.26	3.63	20	
1,1-Dichloroethene	23.83	1.0	20	6.577	86.2	70 - 130	25.72	7.64	20	
1,1-Dichloropropene	19.1	1.0	20	0	95.5	70 - 129	21.15	10.2	20	
1,2,3-Trichlorobenzene	16.28	1.0	20	0	81.4	70 - 130	15.4	5.5	20	
1,2,3-Trichloropropane	16.81	1.0	20	0	84.0	70 - 130	16	4.95	20	
1,2,4-Trichlorobenzene	17.4	1.0	20	0	87.0	70 - 125	16.44	5.68	20	
1,2,4-Trimethylbenzene	18.1	1.0	20	0	90.5	70 - 125	18.54	2.41	20	
1,2-Dibromo-3-chloropropane	15.79	1.0	20	0	79.0	70 - 130	15.26	3.43	20	
1,2-Dibromoethane	18.67	1.0	20	0	93.3	70 - 124	18.38	1.55	20	
1,2-Dichlorobenzene	17.32	1.0	20	0	86.6	70 - 115	17.35	0.157	20	
1,2-Dichloroethane	21.48	1.0	20	2.545	94.7	70 - 127	22.04	2.59	20	
1,2-Dichloropropane	19.75	1.0	20	0	98.7	70 - 122	19.62	0.614	20	
1,3,5-Trimethylbenzene	17.01	1.0	20	0	85.1	70 - 126	17.16	0.847	20	
1,3-Dichlorobenzene	17.83	1.0	20	0	89.2	70 - 119	17.75	0.472	20	
1,3-Dichloropropane	18.33	1.0	20	0	91.7	70 - 121	18.26	0.397	20	
1,4-Dichlorobenzene	17.72	1.0	20	0	88.6	70 - 114	17.48	1.36	20	
2,2-Dichloropropane	20.43	1.0	20	0	102	70 - 130	21.28	4.06	20	
2-Butanone	36.87	2.0	40	0	92.2	70 - 130	34.4	6.96	20	
2-Chlorotoluene	18.91	1.0	20	0	94.5	70 - 130	19.37	2.4	20	
2-Hexanone	34.67	2.0	40	0	86.7	70 - 130	34.34	0.96	20	
4-Chlorotoluene	19.25	1.0	20	0	96.3	70 - 130	19.44	0.982	20	
4-Isopropyltoluene	16.31	1.0	20	0	81.6	70 - 130	16.73	2.56	20	
4-Methyl-2-pentanone	36.78	2.0	40	0	91.9	70 - 130	35.01	4.92	20	
Acetone	35.63	2.0	40	0	89.1	70 - 130	31.8	11.4	20	
Benzene	18.44	1.0	20	0	92.2	70 - 127	18.66	1.21	20	
Bromobenzene	17.43	1.0	20	0	87.1	70 - 115	17.41	0.0855	20	
Bromochloromethane	18.45	1.0	20	0	92.2	70 - 127	18.83	2.03	20	
Bromodichloromethane	18.84	1.0	20	0	94.2	70 - 124	19.09	1.32	20	
Bromoform	17.22	1.0	20	0	86.1	70 - 129	16.88	1.94	20	

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

MSD Sample ID: **HS18101278-01MSD** Units: **ug/L** Analysis Date: **28-Oct-2018 14:22**
Client ID: **67WW14-181022** Run ID: **VOA2_326371** SeqNo: **4795127** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	19.12	1.0	20	0	95.6	70 - 130	19.49	1.88	20	
Carbon disulfide	33.92	2.0	40	0	84.8	70 - 130	35.99	5.92	20	
Carbon tetrachloride	18.76	1.0	20	0	93.8	70 - 130	19.53	4.05	20	
Chlorobenzene	18.41	1.0	20	0	92.0	70 - 114	18.58	0.931	20	
Chloroethane	17.41	1.0	20	0	87.1	70 - 130	18.43	5.66	20	
Chloroform	17.82	1.0	20	0	89.1	70 - 125	18.41	3.26	20	
Chloromethane	13.99	1.0	20	0	70.0	70 - 130	14.47	3.35	20	S
cis-1,2-Dichloroethene	18.77	1.0	20	0	93.9	70 - 128	18.88	0.564	20	
cis-1,3-Dichloropropene	20.12	1.0	20	0	101	70 - 125	20.19	0.377	20	
Dibromochloromethane	18.02	1.0	20	0	90.1	70 - 124	17.77	1.37	20	
Dibromomethane	19.04	1.0	20	0	95.2	70 - 124	18.73	1.63	20	
Dichlorodifluoromethane	8.888	1.0	20	0	44.4	70 - 130	10.34	15.1	20	S
Ethylbenzene	19.4	1.0	20	0	97.0	70 - 124	19.97	2.92	20	
Hexachlorobutadiene	17.43	1.0	20	0	87.1	70 - 130	18.31	4.93	20	
Isopropylbenzene	17.68	1.0	20	0	88.4	70 - 130	18.48	4.4	20	
m,p-Xylene	39.16	2.0	40	0	97.9	70 - 130	40.12	2.42	20	
Methylene chloride	18.06	2.0	20	0	90.3	70 - 128	18.66	3.25	20	
Naphthalene	15.32	1.0	20	0	76.6	70 - 130	13.59	12	20	
n-Butylbenzene	18.38	1.0	20	0	91.9	70 - 130	18.86	2.59	20	
n-Propylbenzene	18.99	1.0	20	0	95.0	70 - 130	19.5	2.62	20	
o-Xylene	19.1	1.0	20	0	95.5	70 - 124	19.53	2.22	20	
sec-Butylbenzene	16.86	1.0	20	0	84.3	70 - 130	17.4	3.16	20	
Styrene	17.53	1.0	20	0	87.6	70 - 130	17.31	1.26	20	
tert-Butylbenzene	18.42	1.0	20	0	92.1	70 - 130	19.09	3.57	20	
Tetrachloroethene	17.73	1.0	20	0	88.7	70 - 130	18.83	6.01	20	
Toluene	17.86	1.0	20	0	89.3	70 - 123	18.42	3.07	20	
trans-1,2-Dichloroethene	18.52	1.0	20	0	92.6	70 - 130	19	2.57	20	
trans-1,3-Dichloropropene	20.68	1.0	20	0	103	70 - 121	19.92	3.74	20	
Trichloroethene	18.11	1.0	20	0	90.5	70 - 129	18.73	3.39	20	
Trichlorofluoromethane	17.05	1.0	20	0	85.2	70 - 130	18.77	9.64	20	
Vinyl chloride	16.27	1.0	20	0	81.3	70 - 130	17.23	5.76	20	
Surr: 1,2-Dichloroethane-d4	*49.58*	*1.0*	*50*	*0*	*99.2*	*70 - 126*	*49.41*	*0.338*	*20*	
Surr: 4-Bromofluorobenzene	*51.35*	*1.0*	*50*	*0*	*103*	*81 - 113*	*51.13*	*0.416*	*20*	
Surr: Dibromofluoromethane	*48.97*	*1.0*	*50*	*0*	*97.9*	*77 - 123*	*49.09*	*0.249*	*20*	

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326371 **Instrument:** VOA2 **Method:** SW8260

MSD Sample ID: **HS18101278-01MSD** Units: **ug/L** Analysis Date: **28-Oct-2018 14:22**
Client ID: **67WW14-181022** Run ID: **VOA2_326371** SeqNo: **4795127** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.94*	*1.0*	*50*	*0*	*89.9*	*82 - 127*	*45.32*	*0.831*	*20*	

The following samples were analyzed in this batch:

HS18101278-01	HS18101278-02	HS18101278-03	HS18101278-04
HS18101278-05	HS18101278-06	HS18101278-07	HS18101278-08
HS18101278-09			

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326268 **Instrument:** UV-2450 **Method:** SM3500FED

MBLK Sample ID: **MBLK-326268** Units: **mg/L** Analysis Date: **24-Oct-2018 10:44**
Client ID: Run ID: **UV-2450_326268** SeqNo: **4792611** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ferrous Iron	0.0500	0.0500				80 - 120				U

LCS Sample ID: **LCS-326268** Units: **mg/L** Analysis Date: **24-Oct-2018 10:44**
Client ID: Run ID: **UV-2450_326268** SeqNo: **4792612** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ferrous Iron	0.268	0.0500	0.25	0	107	80 - 120				

MS Sample ID: **HS18101278-04MS** Units: **mg/L** Analysis Date: **24-Oct-2018 10:44**
Client ID: **67WW13-181023** Run ID: **UV-2450_326268** SeqNo: **4792614** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ferrous Iron	0.232	0.0500	0.25	0.035	78.8	75 - 125				

MSD Sample ID: **HS18101278-04MSD** Units: **mg/L** Analysis Date: **24-Oct-2018 10:44**
Client ID: **67WW13-181023** Run ID: **UV-2450_326268** SeqNo: **4792615** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ferrous Iron	0.231	0.0500	0.25	0.035	78.4	75 - 125	0.232	0.432	20	

The following samples were analyzed in this batch: HS18101278-04 HS18101278-05 HS18101278-06

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: **R326270** **Instrument:** **WetChem_HS** **Method:** **E376.1**

MBLK Sample ID: **MBLK-R326270** Units: **mg/L** Analysis Date: **27-Oct-2018 14:00**
Client ID: Run ID: **WetChem_HS_326270** SeqNo: **4792667** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	1.00	1.00								U

LCS Sample ID: **LCS-R326270** Units: **mg/L** Analysis Date: **27-Oct-2018 14:00**
Client ID: Run ID: **WetChem_HS_326270** SeqNo: **4792666** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.48	1.00	25	0	85.9	80 - 120				

LCSD Sample ID: **LCSD-R326270** Units: **mg/L** Analysis Date: **27-Oct-2018 14:00**
Client ID: Run ID: **WetChem_HS_326270** SeqNo: **4792665** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.68	1.00	25	0	86.7	80 - 120	21.48	0.927	20	

MS Sample ID: **HS18101278-05MS** Units: **mg/L** Analysis Date: **27-Oct-2018 14:00**
Client ID: **67WW08-181023** Run ID: **WetChem_HS_326270** SeqNo: **4792668** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	29.68	1.00	25	-0.12	119	80 - 120				

The following samples were analyzed in this batch: HS18101278-04 HS18101278-05 HS18101278-06

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326282 **Instrument:** ManTech01 **Method:** SM2320B

MBLK Sample ID: **WBLKW1-181027** Units: **mg/L** Analysis Date: **27-Oct-2018 16:14**
Client ID: Run ID: **ManTech01_326282** SeqNo: **4792844** PrepDate: DF: **1**

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

LCS Sample ID: **WLCS1-181027** Units: **mg/L** Analysis Date: **27-Oct-2018 16:23**
Client ID: Run ID: **ManTech01_326282** SeqNo: **4792845** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Alkalinity, Total (As CaCO3)	1077	5.00	1000	0	108	85 - 115				

LCSD Sample ID: **WLCSD1-181027** Units: **mg/L** Analysis Date: **27-Oct-2018 16:32**
Client ID: Run ID: **ManTech01_326282** SeqNo: **4792846** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Alkalinity, Total (As CaCO3)	1062	5.00	1000	0	106	85 - 115	1077	1.42	20	

DUP Sample ID: **HS18101324-02DUP** Units: **mg/L** Analysis Date: **27-Oct-2018 17:03**
Client ID: Run ID: **ManTech01_326282** SeqNo: **4792851** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Alkalinity, Total (As CaCO3)	304.8	5.00					304.8	0.00328	20	

The following samples were analyzed in this batch: HS18101278-04 HS18101278-05 HS18101278-06

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326431 **Instrument:** ICS2100 **Method:** SW9056

MBLK Sample ID: **WBLKW3-102318** Units: **mg/L** Analysis Date: **24-Oct-2018 18:09**
Client ID: Run ID: **ICS2100_326431** SeqNo: **4796255** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	0.500	0.500								U
Nitrogen, Nitrate (As N)	0.100	0.100								U
Nitrogen, Nitrite (As N)	0.100	0.100								U
Sulfate	0.500	0.500								U

LCS Sample ID: **WLCSW3-102318** Units: **mg/L** Analysis Date: **24-Oct-2018 18:23**
Client ID: Run ID: **ICS2100_326431** SeqNo: **4796256** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.45	0.500	20	0	97.3	80 - 120				
Nitrogen, Nitrate (As N)	3.875	0.100	4	0	96.9	80 - 120				
Nitrogen, Nitrite (As N)	4.066	0.100	4	0	102	80 - 120				
Sulfate	19.27	0.500	20	0	96.4	80 - 120				

LCSD Sample ID: **WLCSDW3-102318** Units: **mg/L** Analysis Date: **24-Oct-2018 18:38**
Client ID: Run ID: **ICS2100_326431** SeqNo: **4796257** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.85	0.500	20	0	99.3	80 - 120	19.45	2.04	20	
Nitrogen, Nitrate (As N)	3.933	0.100	4	0	98.3	80 - 120	3.875	1.49	20	
Nitrogen, Nitrite (As N)	4.15	0.100	4	0	104	80 - 120	4.066	2.04	20	
Sulfate	19.79	0.500	20	0	99.0	80 - 120	19.27	2.66	20	

MS Sample ID: **HS18101236-18MS** Units: **mg/L** Analysis Date: **24-Oct-2018 17:11**
Client ID: Run ID: **ICS2100_326431** SeqNo: **4796251** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	21.88	0.500	10	11.83	100	80 - 120				
Nitrogen, Nitrate (As N)	3.495	0.100	2	1.417	104	80 - 120				
Nitrogen, Nitrite (As N)	2.106	0.100	2	0	105	80 - 120				
Sulfate	71.91	0.500	10	63.26	86.5	80 - 120				O

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
WorkOrder: HS18101278

QC BATCH REPORT

Batch ID: R326431 **Instrument:** ICS2100 **Method:** SW9056

MS Sample ID: **HS18101179-04MS** Units: **mg/L** Analysis Date: **25-Oct-2018 01:54**
Client ID: Run ID: **ICS2100_326431** SeqNo: **4796281** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	141.9	5.00	100	40.55	101	80 - 120				
Nitrogen, Nitrate (As N)	20.5	1.00	20	0	103	80 - 120				
Nitrogen, Nitrite (As N)	21.14	1.00	20	0	106	80 - 120				
Sulfate	290.7	5.00	100	191	99.7	80 - 120				

MSD Sample ID: **HS18101236-18MSD** Units: **mg/L** Analysis Date: **24-Oct-2018 17:25**
Client ID: Run ID: **ICS2100_326431** SeqNo: **4796252** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	21.53	0.500	10	11.83	97.0	80 - 120	21.88	1.58	20	
Nitrogen, Nitrate (As N)	3.473	0.100	2	1.417	103	80 - 120	3.495	0.631	20	
Nitrogen, Nitrite (As N)	2.073	0.100	2	0	104	80 - 120	2.106	1.58	20	
Sulfate	70.73	0.500	10	63.26	74.6	80 - 120	71.91	1.66	20	SO

MSD Sample ID: **HS18101179-04MSD** Units: **mg/L** Analysis Date: **25-Oct-2018 02:09**
Client ID: Run ID: **ICS2100_326431** SeqNo: **4796282** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	142.8	5.00	100	40.55	102	80 - 120	141.9	0.654	20	
Nitrogen, Nitrate (As N)	20.56	1.00	20	0	103	80 - 120	20.5	0.292	20	
Nitrogen, Nitrite (As N)	21.31	1.00	20	0	107	80 - 120	21.14	0.829	20	
Sulfate	292.3	5.00	100	191	101	80 - 120	290.7	0.563	20	

The following samples were analyzed in this batch: HS18101278-04 HS18101278-05 HS18101278-06

ALS Houston, US Date: 03-Dec-18

Client:	Aptim Environmental & Infrastucture, Inc.	**QUALIFIERS, ACRONYMS, UNITS**
Project:	LHAAP-67	
WorkOrder:	**HS18101278**	

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/L	Milligrams per Liter

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
North Carolina	624-2018	31-Dec-2018
Arkansas	88-0356	27-Mar-2019
Texas	T10470231-18-21	30-Apr-2019
North Dakota	R193 2018-2019	30-Apr-2019
Illinois	004438	29-Jun-2019
Louisiana	03087	30-Jun-2019
Dept of Defense	ANAB L2231	22-Dec-2018
Kentucky	123043 - 2018	30-Apr-2019
Kansas	E-10352 2018-2019	31-Jul-2019
Oklahoma	2018-156	31-Aug-2019

ALS Houston, US Date: 03-Dec-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-67
Work Order: HS18101278

SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS18101278-01	67WW14-181022	Login	10/24/2018 10:12:39 AM	JML	VOA234
HS18101278-02	67WW12-181022	Login	10/24/2018 10:14:33 AM	JML	VOA234
HS18101278-03	67WW10-181022	Login	10/24/2018 10:14:33 AM	JML	VOA234
HS18101278-04	67WW13-181023	Login	10/24/2018 10:14:33 AM	JML	WET118
HS18101278-04	67WW13-181023	Login	10/24/2018 10:14:33 AM	JML	WET118
HS18101278-04	67WW13-181023	Login	10/24/2018 10:14:33 AM	JML	WET118
HS18101278-04	67WW13-181023	Login	10/24/2018 10:14:33 AM	JML	VOA234
HS18101278-04	67WW13-181023	Login	10/24/2018 10:14:33 AM	JML	Sub
HS18101278-04	67WW13-181023	Login	10/24/2018 10:14:33 AM	JML	Sub
HS18101278-04	67WW13-181023	Login	10/24/2018 10:14:33 AM	JML	Sub
HS18101278-05	67WW08-181023	Login	10/24/2018 10:20:10 AM	JML	WET118
HS18101278-05	67WW08-181023	Login	10/24/2018 10:20:10 AM	JML	WET118
HS18101278-05	67WW08-181023	Login	10/24/2018 10:20:10 AM	JML	WET118
HS18101278-05	67WW08-181023	Login	10/24/2018 10:20:10 AM	JML	VOA234
HS18101278-05	67WW08-181023	Login	10/24/2018 10:20:10 AM	JML	Sub
HS18101278-05	67WW08-181023	Login	10/24/2018 10:20:10 AM	JML	Sub
HS18101278-05	67WW08-181023	Login	10/24/2018 10:20:10 AM	JML	Sub
HS18101278-06	67WW08-181023-FD	Login	10/24/2018 10:20:10 AM	JML	WET118
HS18101278-06	67WW08-181023-FD	Login	10/24/2018 10:20:10 AM	JML	WET118
HS18101278-06	67WW08-181023-FD	Login	10/24/2018 10:20:10 AM	JML	WET118
HS18101278-06	67WW08-181023-FD	Login	10/24/2018 10:20:10 AM	JML	VOA234
HS18101278-06	67WW08-181023-FD	Login	10/24/2018 10:20:10 AM	JML	Sub
HS18101278-06	67WW08-181023-FD	Login	10/24/2018 10:20:10 AM	JML	Sub
HS18101278-06	67WW08-181023-FD	Login	10/24/2018 10:20:10 AM	JML	Sub
HS18101278-07	67WW11-181023	Login	10/24/2018 10:53:58 AM	JML	VOA234
HS18101278-08	67WW09-181023	Login	10/24/2018 10:53:58 AM	JML	VOA234
HS18101278-09	67WW15-181023	Login	10/24/2018 10:53:58 AM	JML	VOA234

ALS Houston, US Date: 03-Dec-18

Sample Receipt Checklist

Client Name:	CBI-Houston	Date/Time Received:	**24-Oct-2018 08:55**
Work Order:	HS18101278	Received by:	**JRM**

Checklist completed by:	*Jared R. Makan*	24-Oct-2018		Reviewed by:	*RJ Modashia*	25-Oct-2018	
	eSignature	Date			eSignature	Date	

Matrices: **Water** Carrier name: **FedEx Priority Overnight**

Question	Yes	No	Other
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	
Chain of custody signed when relinquished and received?	☑	☐	
Chain of custody agrees with sample labels?	☐	☑	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
TX1005 solids received in hermetically sealed vials?	☐	☐	N/A ☑
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	
Temperature(s)/Thermometer(s):	2.0c/1.6c UC/C		IR11
Cooler(s)/Kit(s):	2759		
Date/Time sample(s) sent to storage:	10/24/2018 10:56		
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☑	☐	N/A ☐
pH adjusted?	☐	☑	N/A ☐
pH adjusted by:			

Login Notes: Trip Blank received, not listed on COC. Placed on hold.

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

APTIM

Page 1 of ______

COC ID: 67-OCT2018-GW-ALSHT-1810 TURNAROUND TIME: normal RUSH:

PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name	Longhorn AAP	Lab Name	ALS Laboratories	Email Invoice To	FedInvoices@CBIFederalServices.com
Project Number	501032	Lab Contact	RJ Modashia		
	LHAAP-67	Email	RJ.Modashia@alsglobal.com	Email Report To	Kim.napier@aptim.com
Address	1203-B East Grand Avenue	Address	10450 Stancliff Rd., Suite 210	Mail Reports To	Kim Napier
	PMB 202			Address	2410 Cherahala Blvd.
City	Marshall; State TX	City	Houston; State TX	City	Knoxville; State TN
Postal Code	75670; Country USA	Postal Code	77099; Country USA	Postal Code	37932; Country USA
Phone Number	713.243.7264	Phone Number	281 575.2279 or 281.530.5656		
Project Manager	Praveen Srivastav			Shipping Company	

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Carbon Dioxide in Water by RSK175	Methane, Ethane, Ethene in Water by RSK175	Anions in Water by E300.0	TOC in Water by E415.1	TIC in Water by E415.1	Sulfide in Water by E376.1	Alkalinity by E310.1	Ferrous Iron SM3500-FE-B
67WW14-181022	LHAAP 67	20.85	21.08		WG	10/22/18	1255	3		X								
67WW12-181022	LHAAP 67	26.30	26.55		WG	10/22/18	1345	3		X								
67WW10-181022	LHAAP 67	25.65	25.88		WG	10/22/18	1435	3		X								
67WW13-181023	LHAAP 67	22.38	22.62		WG	10/23/18	0935	13		X	X	X	X	X	X	X	X	X
67WW08-181023	LHAAP 67	24.41	24.62		WG	10/23/18	1045	13		X	X	X	X	X	X	X	X	X
67WW08-181023-FD	LHAAP 67	24.41	24.62		WG	10/23/18	1045	13		X	X	X	X	X	X	X	X	X
67WW11-181023	LHAAP 67	23.95	24.20		WG	10/23/18	1155	3		X								
67WW09-181023	LHAAP 67	22.43	22.65		WG	10/23/18	1245	3		X								
67WW15-181023	LHAAP 67	24.23	24.44		WG	10/23/18	1335	3		X								

HS18101278
Aptim Environmental & Infrastucture, Inc.
LHAAP-67

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Anions should include chloride, nitrate, nitrite, and sulfate.	[signature] /BHATE	10/23/18 1430	ND	10/24/18 08:55

cooler # 2759
Temp 4°C 2.0 IR #11 C/F -0.4

FedEx 4380 9533 6770

0221

WED - 24 OCT 10:30A

PRIORITY OVERNIGHT

AB SGRA

77099

TX-US

IAH

102785 2300110 GGRA

ALS

10450 ancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

CUSTODY SEAL

Date: 10/23/18 Time: 1430

Name: Scott Bessinger

Company: BHATE

Seal Broken By:

Date:

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : 1 360 577 7222
F : 1 360 636 1068
www.alsglobal.com

November 30, 2018

Analytical Report for Service Request No: K1810527

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

RE: HS18101278

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory October 27, 2018
For your reference, these analyses have been assigned our service request number **K1810527.**

Analyses were performed according to our laboratory s NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) 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.

Please contact me if you have any questions. My extension is 3350. You may also contact me via email at Kelley.Lovejoy@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kelley Lovejoy

Kelley Lovejoy
Project Manager

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Table of Contents

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
LOD	Limit of Detection
LOQ	Limit of Quantitation
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.

Inorganic Data Qualifiers

* The result is an outlier. See case narrative.
# The control limit criteria is not applicable. See case narrative.
B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E The result is an estimate amount because the value exceeded the instrument calibration range.
J The result is an estimated value.
U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X See case narrative.
Q See case narrative. One or more quality control criteria was outside the limits.
H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

The control limit criteria is not applicable. See case narrative.
J The result is an estimated value.
E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M The duplicate injection precision was not met.
N The Matrix Spike sample recovery is not within control limits. See case narrative.
S The reported value was determined by the Method of Standard Additions (MSA).
U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X See case narrative.
+ The correlation coefficient for the MSA is less than 0.995.
Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

* The result is an outlier. See case narrative.
# The control limit criteria is not applicable. See case narrative.
A A tentatively identified compound, a suspected aldol-condensation product.
B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D The reported result is from a dilution.
E The result is an estimated value.
J The result is an estimated value.
N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X See case narrative.
Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
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Client: ALS Environmental - US
Project: HS18101278
Sample Matrix: Ground Water

Service Request: K1810527
Date Received: 10/27/2018

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 summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt:

Three ground water samples were received for analysis at ALS Environmental on 10/27/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry:

Method SM 5310 C, 11/14/2018: The Relative Percent Difference (RPD) for the replicate analysis of Total Organic Carbon in samples 67WW13-181023, 67WW08-181023, and 67WW08-181023-FD were outside the normal ALS control limits (12% to 15% RPDs versus a control limit of 10%). The associated QA/QC results (e.g. control sample, matrix spike, method blank, calibration standards, etc.) indicate the analysis was in control. No further corrective action was appropriate.

Method SM 5310 C, 11/27,29/2018: Samples 67WW13-181023, 67WW08-181023, and 67WW08-181023-FD were analyzed past holding time due to laboratory labeling error. The unpreserved containers received for Total Inorganic Carbon were inadvertently labeled as preserved upon receipt. The samples were analyzed as soon as possible after the error was discovered. The data was flagged to indicate the holding time violation.

Approved by Kelley Lovejoy Date 11/30/2018

Chain of Custody

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Subcontract Chain of Custody

COC ID: 10112

SUBCONTRACT TO:

ALS Environmental Kelso
1317 S. 13th Avenue
Kelso, WA 98626

Phone: +1 360 501 3312

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: HS18101278
TSR: Sonia West

	LAB SAMPLE ID / ANALYSIS REQUESTED	CLIENT SAMPLE ID	MATRIX	COLLECT DATE / DUE DATE
1.	**HS18101278-04**	**67WW13-181023**	**Groundwater**	**23 Oct 2018 09:35**
	TIC Analysis with Level IV			01 Nov 2018
	TOC Analysis with DOD Level IV			01 Nov 2018
2.	**HS18101278-05**	**67WW08-181023**	**Groundwater**	**23 Oct 2018 10:45**
	TIC Analysis with Level IV			01 Nov 2018
	TOC Analysis with DOD Level IV			01 Nov 2018
3.	**HS18101278-06**	**67WW08-181023-FD**	**Groundwater**	**23 Oct 2018 10:45**
	TIC Analysis with Level IV			01 Nov 2018
	TOC Analysis with DOD Level IV			01 Nov 2018

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

QC Level: DOD IV (DoD Data Package)

Relinquished By: Pablo Mainez Date/Time: 10.26.18 15:00

Received By: Daniel Hampton Date/Time: 10-27-18 0915

Cooler ID(s): Temperature(s):

RIGHT SOLUTIONS | RIGHT PARTNER

ALS

PC KL

Cooler Receipt and Preservation Form

Client ALS Houston Service Request K18 10527

Received: 10-27-18 Opened: 10-27-18 By: DSP Unloaded: 10-27-18 By: DSP

1. Samples were received via? *USPS* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* ______ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? 2 Top Front

If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected. Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-0.3	-0.2	0.7	0.8	+0.1	351	10112	4380 9534 0062	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* ______
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA Y N

   If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: ______

7/25/16

Page ____ ***of*** ____

General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US		**Service Request:**	K1810527
Project:	HS18101278		**Date Collected:**	10/23/18
Sample Matrix:	Ground Water		**Date Received:**	10/27/18
Analysis Method:	SM 5310 C		**Units:**	mg/L
Prep Method:	None		**Basis:**	NA

Carbon, Total Inorganic

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
67WW13-181023	K1810527-001	**130**	100	50	50	11/27/18 15:27	*
67WW08-181023	K1810527-002	**55**	40	20	20	11/29/18 19:50	*
67WW08-181023-FD	K1810527-003	**58**	40	20	20	11/27/18 16:48	*
Method Blank	K1810527-MB1	ND U	2.0	1.0	1	11/27/18 15:05	
Method Blank	K1810527-MB2	ND U	2.0	1.0	1	11/29/18 19:35	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810527
Project	HS18101278	**Date Collected:**	10/23/18
Sample Matrix:	Ground Water	**Date Received:**	10/27/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Carbon, Total Inorganic

Sample Name:	Lab Code:	MRL	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
67WW13-181023	K1810527-001DUP	100	50	130	130	131	<1	10	11/27/18
67WW08-181023	K1810527-002DUP2	40	20	55	57	56.0	3	10	11/29/18
67WW08-181023-FD	K1810527-003DUP1	40	20	58	59	58.3	2	10	11/27/18

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	**Service Request:**	K1810527
Project:	HS18101278	**Date Collected:**	10/23/18
Sample Matrix:	Ground Water	**Date Received:**	10/27/18
		Date Analyzed:	11/27/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Inorganic

Sample Name:	67WW13-181023	**Units:**	mg/L
Lab Code:	K1810527-001	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1810527-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Inorganic	130	1410	1250	102	83-117

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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	**Service Request:**	K1810527
Project:	HS18101278	**Date Collected:**	10/23/18
Sample Matrix:	Ground Water	**Date Received:**	10/27/18
		Date Analyzed:	11/29/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Inorganic

Sample Name:	67WW08-181023	**Units:**	mg/L
Lab Code:	K1810527-002	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1810527-002MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Inorganic	55	543	500	98	83-117

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	**Service Request:**	K1810527
Project:	HS18101278	**Date Analyzed:**	11/27/18
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Inorganic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	616542

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1810527-LCS1	25.9	25.0	104	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810527
Project:	HS18101278	**Date Analyzed:**	11/29/18
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Inorganic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	616903

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1810527-LCS2	24.3	25.0	97	83-117

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QA/QC Report

Client: ALS Environmental - US
Project: HS18101278

Service Request: K1810527

Continuing Calibration Verification (CCV) Summary

Carbon, Total Inorganic

Analysis Method: SM 5310 C

Units: mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	616542	KQ1817365-07	11/27/18 14:50	25.0	25.0	100	90-110
CCV2	616542	KQ1817365-08	11/27/18 17:23	25.0	25.0	100	90-110
CCV3	616903	KQ1817508-05	11/29/18 19:21	25.0	24.8	99	90-110
CCV4	616903	KQ1817508-06	11/29/18 20:23	25.0	24.5	98	90-110

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1810527
Project: HS18101278

Continuing Calibration Blank (CCB) Summary
Carbon, Total Inorganic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	MRL	MDL	Result	Q
CCB1	616542	KQ1817365-09	11/27/18 14:57	2.0	1.0	ND	U
CCB2	616542	KQ1817365-10	11/27/18 17:33	2.0	1.0	ND	U
CCB3	616903	KQ1817508-07	11/29/18 19:28	2.0	1.0	ND	U
CCB4	616903	KQ1817508-08	11/29/18 20:30	2.0	1.0	ND	U

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1810527
Project:	HS18101278	**Date Collected:**	10/23/18
Sample Matrix:	Ground Water	**Date Received:**	10/27/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
67WW13-181023	K1810527-001	**3.99**	0.50	0.20	0.07	1	11/13/18 23:43	
67WW08-181023	K1810527-002	**2.86**	0.50	0.20	0.07	1	11/14/18 00:47	
67WW08-181023-FD	K1810527-003	**3.19**	0.50	0.20	0.07	1	11/14/18 01:51	
Method Blank	K1810527-MB1	ND U	0.50	0.20	0.07	1	11/12/18 20:31	
Method Blank	K1810527-MB2	ND U	0.50	0.20	0.07	1	11/13/18 06:23	
Method Blank	K1810527-MB3	ND U	0.50	0.20	0.07	1	11/13/18 17:03	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810527
Project	HS18101278	**Date Collected:**	10/23/18
Sample Matrix:	Ground Water	**Date Received:**	10/27/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Carbon, Total Organic

Sample Name:	Lab Code:	MRL	LOQ	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
67WW13-181023	K1810527-001DUP	0.50	0.20	0.07	3.99	3.42	3.71	15 *	10	11/13/18
67WW08-181023	K1810527-002DUP1	0.50	0.20	0.07	2.86	2.55	2.71	12 *	10	11/14/18
67WW08-181023-FD	K1810527-003DUP1	0.50	0.20	0.07	3.19	2.78	2.98	14 *	10	11/14/18

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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	**Service Request:**	K1810527
Project:	HS18101278	**Date Collected:**	10/23/18
Sample Matrix:	Ground Water	**Date Received:**	10/27/18
		Date Analyzed:	11/14/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	67WW13-181023	**Units:**	mg/L
Lab Code:	K1810527-001	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1810527-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Organic	3.99	29.1	25.0	101	83-117

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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	**Service Request:**	K1810527
Project:	HS18101278	**Date Analyzed:**	11/12/18
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	614837

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1810527-LCS1	22.3	21.9	102	83-117
Lab Control Sample	K1810527-LCS2	21.5	21.9	98	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810527
Project:	HS18101278	**Date Analyzed:**	11/13/18
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	614838

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1810527-LCS3	21.6	21.9	99	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1810527
Project: HS18101278

Continuing Calibration Verification (CCV) Summary

Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	614837	KQ1816883-31	11/12/18 19:57	25.0	25.5	102	90-110
CCV2	614837	KQ1816883-32	11/12/18 23:59	25.0	25.1	101	90-110
CCV3	614837	KQ1816883-33	11/13/18 05:50	25.0	25.1	101	90-110
CCV4	614837	KQ1816883-34	11/13/18 10:54	25.0	25.0	100	90-110
CCV5	614837	KQ1816883-35	11/13/18 16:30	25.0	25.1	100	90-110
CCV6	614837	KQ1816883-36	11/13/18 21:03	25.0	25.5	102	90-110
CCV7	614838	KQ1816886-22	11/13/18 16:30	25.0	25.1	100	90-110
CCV8	614838	KQ1816886-23	11/13/18 21:03	25.0	25.5	102	90-110
CCV9	614838	KQ1816886-24	11/14/18 02:23	25.0	25.2	101	90-110
CCV10	614838	KQ1816886-25	11/14/18 07:59	25.0	24.9	100	90-110

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: HS18101278
Service Request: K1810527

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

Analysis Method: SM 5310 C
Units: mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	614837	KQ1816883-37	11/12/18 20:14	0.50	0.20	0.07	ND	U
CCB2	614837	KQ1816883-38	11/13/18 00:16	0.50	0.20	0.07	ND	U
CCB3	614837	KQ1816883-39	11/13/18 06:06	0.50	0.20	0.07	ND	U
CCB4	614837	KQ1816883-40	11/13/18 11:11	0.50	0.20	0.07	ND	U
CCB5	614837	KQ1816883-41	11/13/18 16:46	0.50	0.20	0.07	ND	U
CCB6	614837	KQ1816883-42	11/13/18 21:20	0.50	0.20	0.07	ND	U
CCB7	614838	KQ1816886-26	11/13/18 16:46	0.50	0.20	0.07	ND	U
CCB8	614838	KQ1816886-27	11/13/18 21:20	0.50	0.20	0.07	ND	U
CCB9	614838	KQ1816886-28	11/14/18 02:39	0.50	0.20	0.07	ND	U
CCB10	614838	KQ1816886-29	11/14/18 08:15	0.50	0.20	0.07	ND	U

Raw Data

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
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General Chemistry

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Work Request # (Original ________) K1810527

Tier: IV

Date Analyzed: 11/27/18

Analyst: CES

Run # 616542

Analysis: TIC

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA

COMMENTS:

RA 0527-2 over diluted

Final Approved by: [signature] Date: 11/28/18

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 616542 **Method/Testcode:** SM 5310 C/TIC

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1810527-001	Carbon, Total Inorganic	N/A		Ground Water	2.61 mg/L	10 ml	130 mg/L	50	50	100			11/27/18 15:27	N	IV
K1810527-002	Carbon, Total Inorganic	N/A		Ground Water	1.24 mg/L	10 ml	100 mg/L U	50	50	100			11/27/18 16:12	N	IV
K1810527-003	Carbon, Total Inorganic	N/A		Ground Water	2.88 mg/L	10 ml	58 mg/L	20	20	40			11/27/18 16:48	N	IV
KQ1817365-01	Carbon, Total Inorganic	MS	K1810527-001	Ground Water	28.18 mg/L	10 ml	1410 mg/L	50	50	100	102		11/27/18 15:44	N	IV
KQ1817365-02	Carbon, Total Inorganic	DUP	K1810527-001	Ground Water	2.62 mg/L	10 ml	130 mg/L	50	50	100		<1	11/27/18 15:27	N	IV
KQ1817365-03	Carbon, Total Inorganic	DUP	K1810527-002	Ground Water	1.29 mg/L	10 ml	60 mg/L J	50	50	100		NC	11/27/18 16:12	N	IV
KQ1817365-04	Carbon, Total Inorganic	DUP	K1810527-003	Ground Water	2.95 mg/L	10 ml	59 mg/L	20	20	40		2	11/27/18 16:48	N	IV
KQ1817365-05	Carbon, Total Inorganic	MB		Ground Water	1.499999999999997E	10 ml	2.0 mg/L U	1	1.0	2.0			11/27/18 15:05	N	IV
KQ1817365-06	Carbon, Total Inorganic	LCS		Ground Water	25.95 mg/L	10 ml	25.9 mg/L	1	1.0	2.0	104		11/27/18 15:12	N	IV
KQ1817365-07	Carbon, Total Inorganic	CCV		Ground Water	25.02 mg/L	10 ml	25.0 mg/L	1			100		11/27/18 14:50	N	IV
KQ1817365-08	Carbon, Total Inorganic	CCV		Ground Water	24.99 mg/L	10 ml	25.0 mg/L	1			100		11/27/18 17:23	N	IV
KQ1817365-09	Carbon, Total Inorganic	CCB		Ground Water	0.00 mg/L	10 ml	2.0 mg/L U	1	1.0	2.0			11/27/18 14:57	N	IV
KQ1817365-10	Carbon, Total Inorganic	CCB		Ground Water	0.04 mg/L	10 ml	2.0 mg/L U	1	1.0	2.0			11/27/18 17:33	N	IV

11/28/18

CES 11/28/18

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Printed 11/28/18 13:26

0.094	0.094	0.094	0.094	OBSERVATIONS	3	0.0935
0.094	0.094	0.094	0.094	STD Deviation	0.02064	0.0938
0.129				AVERAGE	0.10557	ABOVE
				UCL	0.12621	BELOW
				LCL	0.08493	BELOW
						BELOW
						BELOW
				OBSERVATIONS	2	BELOW
				STD Deviation	0.02595	BELOW
				AVERAGE	0.09365	BELOW
				UCL	0.11960	BELOW
				LCL	0.06770	BELOW
						BELOW
						BELOW
				OBSERVATIONS	2	BELOW
				STD Deviation	0.02595	BELOW
				AVERAGE	0.09365	BELOW
				UCL	0.11960	BELOW
				LCL	0.06770	BELOW
						BELOW
						BELOW
				OBSERVATIONS	2	BELOW
				STD Deviation	0.00030	BELOW
				AVERAGE	0.09365	BELOW
						BELOW
						BELOW
						BELOW
						BELOW
						BELOW
						BELOW

11/28/18

TIC: 616542

Schedule: 11272018

Version: 11
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2018/11/27 16:32 - Tuesday

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps	Use	State
(Clean)	Clean	Clean		1	True	Ready
(Clean)	Clean	Clean		1	True	Ready
D	Sample	RB	IC 030411 (IC 030411)	1	True	Ready
(Clean)	Clean	Clean		1	True	Ready
D	Sample	RB	IC 030411 (IC 030411)	1	True	Ready
(Blank)	Blank	Reagent/Acid Blank		1	True	Ready
D	Sample	RB	IC 030411 (IC 030411)	2	True	Ready
A	Check Standard	[IC] CCV 030411 [25.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
D	Check Standard	[IC] CCB 030411 [0.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
1	Sample	MB1	IC 030411 (IC 030411)	1	True	Ready
2	Check Standard	[IC] LCS 030411 [25.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
3	Sample	RB	IC 030411 (IC 030411)	1	True	Ready
4	Sample	K1810527-001.02 50x	IC 030411 (IC 030411)	2	True	Ready
5	Sample	K1810527-001.02 ms 50x	IC 030411 (IC 030411)	1	True	Ready
6	Sample	RB	IC 030411 (IC 030411)	2	True	Ready
7	Sample	K1810527-002.04 50x	IC 030411 (IC 030411)	2	True	Ready
8	Sample	RB	IC 030411 (IC 030411)	2	True	Ready
9	Sample	K1810527-003.03 20x	IC 030411 (IC 030411)	2	True	Ready
10	Sample	RB	IC 030411 (IC 030411)	2	True	Ready
A	Check Standard	[IC] CCV 030411 [25.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
D	Check Standard	[IC] CCB 030411 [0.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
1	Sample		IC 030411 (IC 030411)	1	True	Ready
					False	

11/28/18

Fusion Report - 11272018
Tuesday, November 27, 2018 12:01 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2018/11/27 17:49 - Tuesday

Report Summary Information

Company Location:	Gen Chem Lab
Schedule Name:	11272018
Instrument Name:	Fusion1
Report Version:	1 of 1
Report Creation by Operators (schedule version):	Fusion1 (Fusion1) (v6) Fusion1 (Fusion1) (v8) Fusion1 (Fusion1) (v10) Fusion1 (Fusion1) (v11)
Comment:	

Engine Version:	1.1.5.1
Firmware Version:	1.2.0696
Connection:	RS232 COM1

11/28/18

Report Results

Sample Type: Clean

From Schedule Version 6

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/27 12:01

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	7.32	10.63	3.32	49.28	05:28
2	TC Clean	5.73	8.32	2.59	49.83	07:17
3	TC Clean	2.74	5.54	2.80	49.84	06:59
4	TC Clean	2.30	4.95	2.65	49.89	07:02

Sample Type: Clean

From Schedule Version 8

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/27 12:33

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.94	3.39	2.45	49.29	05:17
2	TC Clean	5.15	7.92	2.77	49.85	07:17
3	TC Clean	3.04	5.61	2.58	49.87	07:04

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4	TC Clean	2.96	5.78	2.82	49.85	07:01

Sample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	IC	RB	0.1315 ppm	0.0000 ppm	0.0000%	2018/11/27 13:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.1315	0.5261	3.46	6.39	2.93	49.11	04:56

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.5279 (IC) (v1190)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Clean — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/27 13:11

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	6.79	9.47	2.68	49.34	05:27
2	TC Clean	5.55	8.44	2.89	49.83	07:16
3	TC Clean	2.23	4.96	2.73	49.87	07:01
4	TC Clean	2.05	4.78	2.73	49.88	07:01

Sample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	IC	RB	0.0882 ppm	0.0000 ppm	0.0000%	2018/11/27 13:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.0882	0.3529	2.83	5.80	2.97	49.08	04:59

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.5279 (IC) (v1190)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Blank (Creating v1191) — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2018/11/27 13:50

Rep	Base Analysis	Adjusted	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

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#	Type	(Abs)				
1	IC Clean	6.39	9.10	2.71	49.28	05:29
2	TC Clean	4.22	6.98	2.76	49.87	07:18
3	TC Clean	2.03	4.79	2.77	49.89	07:01
4	TC Clean	2.31	4.97	2.66	49.90	07:01
5	Reagent Blank	4.25	6.92	2.67	49.93	08:11
6	Acid Blank	1.10	3.79	2.69	49.28	05:36

Sample Type: Sample

From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	IC	RB	0.0894 ppm	0.0232 ppm	25.9000%	2018/11/27 14:37

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.0731	0.2923	2.79	5.74	2.95	49.15	04:59
2	IC	0.1058	0.4233	3.27	5.70	2.43	49.17	04:58

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Check Standard --> CCV 030411

From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	A	IC	25.0000	1:1	[IC] CCV 030411 [25.0 ppm]	0 / infinity (NA / NA)	25.1088 ppm (PASS)	0.0000 ppm	0%	2018/11/27 14:50

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
A	IC	25.0 ppm	1	25.1088	100.4352	371.78	374.43	2.66	49.14	04:56

Completion State	Success Action	Method	Calibration	STD Conc - Pos A
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	25 ppmC

Sample Type: Check Standard --> CCB 030411

From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	IC	DI Water [0]	DI	[IC] CCB 030411 [0.0 ppm]	0 / infinity (NA / NA)	0.0935 ppm (PASS)	0.0000 ppm	0%	2018/11/27 14:57

00954688

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	IC	0.0 ppm	1	0.0935	0.3739	3.71	6.50	2.80	49.18	04:40

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	0 ppmC

Sample Type: Sample

From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	IC	MB1	0.0938 ppm	0.0000 ppm	0.0000%	2018/11/27 15:05

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.0938	0.3752	3.10	5.86	2.76	49.12	05:02

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Check Standard --> LCS 030411

From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	IC	25.0000	1:1	[IC] LCS 030411 [25.0 ppm]	0 / infinity (NA / NA)	26.0429 ppm (PASS)	0.0000 ppm	0%	2018/11/27 15:12

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	IC	25.0 ppm	1	26.0429	104.1716	385.52	388.53	3.01	49.20	05:02

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	25 ppmC

Sample Type: Sample

From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	IC	RB	0.2719 ppm	0.0000 ppm	0.0000%	2018/11/27 15:19

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.2719	1.0875	5.72	8.64	2.93	49.19	05:00

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

00954689

◈	4	IC	K1810527-001.02 50x	2.7126 ppm	0.0064 ppm	0.2400%	2018/11/27 15:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	2.7081	10.8324	41.56	44.52	2.96	49.12	07:26
2	IC	2.7171	10.8686	41.69	44.52	2.82	49.10	07:28

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	IC	K1810527-001.02 ms 50x	28.2704 ppm	0.0000 ppm	0.0000%	2018/11/27 15:44

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	28.2704	113.0816	417.68	420.50	2.82	49.03	07:32

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	IC	RB	0.3821 ppm	0.0066 ppm	1.7200%	2018/11/27 15:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.3774	1.5096	7.27	10.33	3.06	49.00	07:24
2	IC	0.3867	1.5469	7.41	10.08	2.67	49.02	07:28

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	IC	K1810527-002.04 50x	1.3579 ppm	0.0404 ppm	2.9800%	2018/11/27 16:12

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	1.3293	5.3173	21.27	24.05	2.77	49.08	07:27
2	IC	1.3865	5.5459	22.12	24.71	2.59	49.10	07:26

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	IC	RB	0.5950 ppm	0.0202 ppm	3.4000%	2018/11/27 16:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.5807	2.3228	10.26	13.00	2.75	49.08	07:24
2	IC	0.6093	2.4372	10.68	13.17	2.49	49.07	07:28

Dilution	Blank Contribution	Method	Calibration

00954690

1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Sample

From Schedule Version 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	IC	K1810527-003.03 20x	3.0091 ppm	0.0475 ppm	1.5800%	2018/11/27 16:48

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	2.9755	11.9021	45.50	48.29	2.80	49.14	07:27
2	IC	3.0428	12.1710	46.48	49.17	2.69	49.13	07:25

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	IC	RB	0.5392 ppm	0.0200 ppm	3.7100%	2018/11/27 17:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.5250	2.1001	9.44	12.41	2.97	49.16	07:28
2	IC	0.5533	2.2132	9.86	12.37	2.52	49.15	07:28

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Check Standard --> CCV 030411

From Schedule Version 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	A	IC	25.0000	1:1	[IC] CCV 030411 [25.0 ppm]	0 / infinity (NA / NA)	25.0836 ppm (PASS)	0.0000 ppm	0%	2018/11/27 17:23

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
A	IC	25.0 ppm	1	25.0836	100.3344	371.40	374.25	2.85	49.16	07:25

Completion State	Success Action	Method	Calibration	STD Conc - Pos A
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	25 ppmC

Sample Type: Check Standard --> CCB 030411

From Schedule Version 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	IC	DI Water [0]	DI	[IC] CCB 030411 [0.0 ppm]	0 / infinity (NA / NA)	0.1294 ppm (PASS)	0.0000 ppm	0%	2018/11/27 17:33

00954691

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	IC	0.0 ppm	1	0.1294	0.5177	4.24	7.07	2.84	49.20	04:47

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	0 ppmC

Sample Type: Sample

From Schedule Version 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	IC		0.1479 ppm	0.0000 ppm	0.0000%	2018/11/27 17:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.1479	0.5916	3.89	6.68	2.79	49.19	05:05

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.7149 (IC) (v1191)	IC 030411 (v3)	IC 030411 (v13)

Meta Data Used in this Report

Blanks

Version	Reagent (Abs)	Acid (Abs)	DI IC (Abs)	DI TC (Abs)	DI TOC (Abs)	Save Time	Operator
v1190	3.0817	0.7240	0.0000	0.0000	0.0000	2018/11/27 10:13	Fusion1 (Fusion1)
v1191	1.4167	1.0980	0.0000	0.0000	0.0000	2018/11/27 14:37	Fusion1 (Fusion1)

Calibrations

Name: IC 030411 (IC)

Version: v13

Ver Creation: 2018/11/20 15:25

Comment:

Operator: Fusion1 (Fusion1)

Basic Analysis Type: IC

Calibration curve formula: IC: $y = 14.714x + 2.332$

r^2 value: IC: $r^2 = 0.99968$

Basic Analysis Type: IC

Sample ID	Y Raw Value	X Expected	Message	End Time
0.0 ppm	4.3260	0.0000		2018/11/20 14:40
0.50 ppm	12.5220	0.5000		2018/11/20 14:47

1.00 ppm	20.0790	1.0000		2018/11/20 14:54
5.00 ppm	74.7040	5.0000		2018/11/20 15:02
10.0 ppm	146.8910	10.0000		2018/11/20 15:09
25.0 ppm	360.9070	25.0000		2018/11/20 15:16
50.0 ppm	743.1960	50.0000		2018/11/20 15:24

Methods

Name: IC 030411 (IC)

Version: v3
Operator: Gen Chem Lab (Fusion1)
Ver Creation: 2013/02/04 11:47
Comment:

Parameter	Value
SampleVolume	4.0 mL
Dilution	1:2
AcidVolume	1.0 ml
DetectorSweepFlow	500 ml/min
PreSpargeTime	0.00 mins
SystemFlow	200 ml/min

Advanced Parameter	Value
NeedleRinseVolume	5.0 ml
VialPrimeVolume	2.0 ml
ICSamplePrimeVolume	2.0 ml
BaselineStabilizeTime	0.70 min
DetectorPressureFlow	300 ml/min
SyringeSpeedWaste	10
SyringeSpeedAcid	7
SyringeSpeedReagent	7
SyringeSpeedDIWater	7
NDIRPressurization	50 psig
SyringeSpeedSampleDispense	5
SyringeSpeedSampleAspirate	4
SyringeSpeedUVDispense	7
SyringeSpeedUVAspirate	5
SyringeSpeedICDispense	7
SyringeSpeedICAspirate	5
NDIRPressureStabilize	0.50 min
LowLevelFilterNDIR	Off

Acceptance / Approval

Electronic Signatures

Report Version	User Name	Acceptance	Reason	Date

Report History

Report History

Report Version	User Name	System Reason	User Reason	Date
1	Fusion1 (Fusion1)	Schedule completed	Schedule completed	2018/11/27 17:49

StarLIMS Run: 616542

Analysis: TIC

Method: SM 5310 C

CCV: 11-GEN-05-72A 25 ppm LCS: 11-GEN-05-67D 25 ppm

ICAL Date: 11/20/18

ICAL ID: 11-GEN-05-72D

Spike ID: 11-GEN-05-67A 0.25 ml of 1000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

21 % H_3PO_4: 11-GEN-05-72C

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, N11314F, Marge

FILTER ID: NA

Analyzed By: CES	Date Analyzed: 11/27/18
Reviewed By: [signature]	Date Reviewed: 11/28/18

Work Request # (Original ______) K1810527

Tier: IV

Date Analyzed: 11/29/18

Analyst: CES

Run # 616903

Analysis: TIC

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA

COMMENTS:

Re analyzed past hold

Final Approved by: [signature] Date: 11/30/18

DQREPORT

C:\Documents and Settings\adam.bradbury\My Documents\DATAQUAL.DOC

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 616903 **Method/Testcode:** SM 5310 C/TIC

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1810527-002	Carbon, Total Inorganic	N/A		Ground Water	2.76 mg/L	10 ml	55 mg/L	20	20	40			11/29/18 19:50	N	IV
KQ1817508-01	Carbon, Total Inorganic	MS	K1810527-002	Ground Water	27.15 mg/L	10 ml	543 mg/L	20	20	40	98		11/29/18 20:03	N	IV
KQ1817508-02	Carbon, Total Inorganic	DUP	K1810527-002	Ground Water	2.83 mg/L	10 ml	57 mg/L	20	20	40		3	11/29/18 19:50	N	IV
KQ1817508-03	Carbon, Total Inorganic	MB		Ground Water	-0.13 mg/L	10 ml	2.0 mg/L U	1	1.0	2.0			11/29/18 19:35	N	IV
KQ1817508-04	Carbon, Total Inorganic	LCS		Ground Water	24.28 mg/L	10 ml	24.3 mg/L	1	1.0	2.0	97		11/29/18 19:43	N	IV
KQ1817508-05	Carbon, Total Inorganic	CCV		Ground Water	24.81 mg/L	10 ml	24.8 mg/L	1			99		11/29/18 19:21	N	IV
KQ1817508-06	Carbon, Total Inorganic	CCV		Ground Water	24.50 mg/L	10 ml	24.5 mg/L	1			98		11/29/18 20:23	N	IV
KQ1817508-07	Carbon, Total Inorganic	CCB		Ground Water	8.29999999999997E	10 ml	2.0 mg/L U	1	1.0	2.0			11/29/18 19:28	N	IV
KQ1817508-08	Carbon, Total Inorganic	CCB		Ground Water	-0.01 mg/L	10 ml	2.0 mg/L U	1	1.0	2.0			11/29/18 20:30	N	IV

11/30/18

CES 11/30/18

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

0.339	0.339	0.339	0.339	OBSERVATIONS	3	0.3388
0.204				STD Deviation	0.07350	BELOW
0.322	0.322	0.322	0.322	AVERAGE	0.28833	0.3222
				UCL	0.36184	BELOW
				LCL	0.21483	BELOW
						BELOW
						BELOW
				OBSERVATIONS	2	BELOW
				STD Deviation	0.09162	BELOW
				AVERAGE	0.33050	BELOW
				UCL	0.42212	BELOW
				LCL	0.23888	BELOW
						BELOW
						BELOW
				OBSERVATIONS	2	BELOW
				STD Deviation	0.09162	BELOW
				AVERAGE	0.33050	BELOW
				UCL	0.42212	BELOW
				LCL	0.23888	BELOW
						BELOW
						BELOW
				OBSERVATIONS	2	BELOW
				STD Deviation	0.01660	BELOW
				AVERAGE	0.33050	BELOW
						BELOW
						BELOW
						BELOW
						BELOW
						BELOW
						BELOW

11/30/18

TIC: 616903

Schedule: 11292018B

Version: 1
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2018/11/29 17:20 - Thursday

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps	Use	State
(Clean)	Clean	Clean		1	True	Ready
(Clean)	Clean	Clean		1	True	Ready
(Clean)	Clean	Clean		1	True	Ready
D	Sample	RB	IC 030411 (IC 030411)	1	True	Ready
(Blank)	Blank	Reagent/Acid Blank		1	True	Ready
D	Sample	RB	IC 030411 (IC 030411)	1	True	Ready
A	Check Standard	[IC] CCV 030411 [25.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
D	Check Standard	[IC] CCB 030411 [0.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
1	Sample	MB1	IC 030411 (IC 030411)	1	True	Ready
2	Check Standard	[IC] LCS 030411 [25.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
3	Sample	K1810527-002.04 20x	IC 030411 (IC 030411)	2	True	Ready
4	Sample	K1810527-002.04 ms 20x	IC 030411 (IC 030411)	1	True	Ready
5	Sample	RB	IC 030411 (IC 030411)	2	True	Ready
A	Check Standard	[IC] CCV 030411 [25.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
D	Check Standard	[IC] CCB 030411 [0.0 ppm]	IC 030411 (IC 030411)	1	True	Ready
					False	

11/30/18

Fusion Report - 11292018B
Thursday, November 29, 2018 05:26 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2018/11/30 07:46 - Friday

Report Summary Information

Company Location:	Gen Chem Lab		
Schedule Name:	11292018B	Engine Version:	1.1.5.1
Instrument Name:	Fusion1	Firmware Version:	1.2.0696
Report Version:	1 of 1	Connection:	RS232 COM1
Report Creation by Operators (schedule version):	Fusion1 (Fusion1) (v1)		
Comment:			

Report Results

11/30/18 [signature]

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/29 17:26

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	15.83	18.62	2.80	49.33	05:28
2	TC Clean	5.39	8.08	2.69	49.99	04:06
3	TC Clean	2.06	4.74	2.68	50.03	03:49
4	TC Clean	2.69	5.43	2.74	50.01	03:47

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/29 17:48

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	1.05	3.42	2.37	49.28	05:19
2	TC Clean	5.19	7.86	2.67	50.02	04:05
3	TC Clean	2.76	5.59	2.83	50.09	03:47
4	TC Clean	2.42	5.36	2.94	50.03	03:49

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Sample Type: Clean

From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/29 18:10

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.86	3.57	2.71	49.28	05:19
2	TC Clean	6.75	9.73	2.98	49.97	04:02
3	TC Clean	4.32	7.17	2.85	50.12	03:51
4	TC Clean	3.86	6.71	2.84	50.04	03:57

Sample Type: Sample

From Schedule Version 1

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	IC	RB	0.2020 ppm	0.0000 ppm	0.0000%	2018/11/29 18:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.2020	0.8081	4.66	7.67	3.00	49.11	05:02

Dilution	**Blank Contribution**	**Method**	**Calibration**
1:2	(TC) 1.6884 (IC) (v1192)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Blank (Creating v1193)

From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2018/11/29 18:40

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	15.13	17.96	2.83	49.32	05:25
2	TC Clean	6.81	9.67	2.86	50.03	04:05
3	TC Clean	2.13	5.12	2.99	50.03	03:48
4	TC Clean	2.01	4.89	2.88	50.01	03:45
5	Reagent Blank	4.25	6.99	2.74	50.03	05:04
6	Acid Blank	0.88	3.59	2.71	49.30	05:34

Sample Type: Sample

From Schedule Version 1

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	IC	RB	0.1990 ppm	0.0000 ppm	0.0000%	2018/11/29 19:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.1990	0.7959	4.54	7.95	3.42	48.96	04:56

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.6084 (IC) (v1193)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Check Standard --> CCV 030411 — From Schedule Version 1

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	A	IC	25.0000	1:1	[IC] CCV 030411 [25.0 ppm]	0 / infinity (NA / NA)	25.1387 ppm (PASS)	0.0000 ppm	0%	2018/11/29 19:21

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
A	IC	25.0 ppm	1	25.1387	100.5548	372.22	375.42	3.21	49.08	04:57

Completion State	Success Action	Method	Calibration	STD Conc - Pos A
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	25 ppmC

Sample Type: Check Standard --> CCB 030411 — From Schedule Version 1

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	IC	DI Water [0]	DI	[IC] CCB 030411 [0.0 ppm]	0 / infinity (NA / NA)	0.3388 ppm (PASS)	0.0000 ppm	0%	2018/11/29 19:28

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	IC	0.0 ppm	1	0.3388	1.3553	7.32	10.54	3.23	49.07	04:36

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	0 ppmC

Sample Type: Sample — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	IC	MB1	0.2040 ppm	0.0000 ppm	0.0000%	2018/11/29 19:35

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.2040	0.8160	4.61	8.04	3.43	49.02	04:54

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.6084 (IC) (v1193)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Check Standard --> LCS 030411 From Schedule Version 1

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	IC	25.0000	1:1	[IC] LCS 030411 [25.0 ppm]	0 / infinity (NA / NA)	24.6153 ppm (PASS)	0.0000 ppm	0%	2018/11/29 19:43

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	IC	25.0 ppm	1	24.6153	98.4613	364.51	367.86	3.35	49.02	04:58

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	25 ppmC

Sample Type: Sample From Schedule Version 1

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	IC	K1810527-002.04 20x	3.1290 ppm	0.0504 ppm	1.6100%	2018/11/29 19:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	3.0934	12.3737	47.12	50.40	3.28	49.05	04:55
2	IC	3.1646	12.6586	48.17	51.04	2.87	49.01	04:56

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.6084 (IC) (v1193)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	IC	K1810527-002.04 ms 20x	27.4817 ppm	0.0000 ppm	0.0000%	2018/11/29 20:03

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	27.4817	109.9269	405.97	409.25	3.28	49.02	04:56

Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.6084 (IC) (v1193)	IC 030411 (v3)	IC 030411 (v13)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	IC	RB	0.3380 ppm	0.0033 ppm	0.9700%	2018/11/29 20:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC	0.3357	1.3429	6.55	9.85	3.30	49.07	04:59
2	IC	0.3403	1.3614	6.62	9.38	2.76	49.00	04:56

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Dilution	Blank Contribution	Method	Calibration
1:2	(TC) 1.6084 (IC) (v1193)	IC 030411 (v3)	IC 030411 (v13)

Sample Type: Check Standard --> CCV 030411

From Schedule Version 1

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	A	IC	25.0000	1:1	[IC] CCV 030411 [25.0 ppm]	0 / infinity (NA / NA)	24.8266 ppm (PASS)	0.0000 ppm	0%	2018/11/29 20:23

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
A	IC	25.0 ppm	1	24.8266	99.3065	367.62	371.09	3.47	49.07	04:58

Completion State	Success Action	Method	Calibration	STD Conc - Pos A
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	25 ppmC

Sample Type: Check Standard --> CCB 030411

From Schedule Version 1

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	IC	DI Water [0]	DI	[IC] CCB 030411 [0.0 ppm]	0 / infinity (NA / NA)	0.3222 ppm (PASS)	0.0000 ppm	0%	2018/11/29 20:30

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	IC	0.0 ppm	1	0.3222	1.2887	7.07	10.36	3.29	49.04	04:38

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	IC 030411 (v3)	IC 030411 (v13)	0 ppmC

Meta Data Used in this Report

Blanks

Version	Reagent (Abs)	Acid (Abs)	DI IC (Abs)	DI TC (Abs)	DI TOC (Abs)	Save Time	Operator
v1192	1.6810	1.0450	0.0000	0.0000	0.0000	2018/11/27 21:11	Fusion1 (Fusion1)
v1193	1.4157	0.8850	0.0000	0.0000	0.0000	2018/11/29 19:13	Fusion1 (Fusion1)

Calibrations

00954704

Name: IC 030411 (IC)

Version:	v13	Calibration curve formula:	IC: y = 14.714x + 2.332
Ver Creation:	2018/11/20 15:25	r^2 value:	IC: r^2 = 0.99968
Comment:			
~~Operator:~~	~~Fusion1 (Fusion1~~		
Basic Analysis Type	IC		

Basic Analysis Type: IC

Sample ID	Y Raw Value	X Expected	Message	End Time
0.0 ppm	4.3260	0.0000		2018/11/20 14:40
0.50 ppm	12.5220	0.5000		2018/11/20 14:47
1.00 ppm	20.0790	1.0000		2018/11/20 14:54
5.00 ppm	74.7040	5.0000		2018/11/20 15:02
10.0 ppm	146.8910	10.0000		2018/11/20 15:09
25.0 ppm	360.9070	25.0000		2018/11/20 15:16
50.0 ppm	743.1960	50.0000		2018/11/20 15:24

Methods

Name: IC 030411 (IC)

Version:	v3	Operator:	Gen Chem Lab (Fusion1)
Ver Creation:	2013/02/04 11:47		
Comment:			

Parameter	Value
SampleVolume	4.0 mL
Dilution	1:2
AcidVolume	1.0 ml
DetectorSweepFlow	500 ml/min
PreSpargeTime	0.00 mins
SystemFlow	200 ml/min

Advanced Parameter	Value
NeedleRinseVolume	5.0 ml
VialPrimeVolume	2.0 ml
ICSamplePrimeVolume	2.0 ml
BaselineStabilizeTime	0.70 min
DetectorPressureFlow	300 ml/min
SyringeSpeedWaste	10
SyringeSpeedAcid	7
SyringeSpeedReagent	7
SyringeSpeedDIWater	7
NDIRPressurization	50 psig
SyringeSpeedSampleDispense	5
SyringeSpeedSampleAspirate	4
SyringeSpeedUVDispense	7
SyringeSpeedUVAspirate	5
SyringeSpeedICDispense	7
SyringeSpeedICAspirate	5
NDIRPressureStabilize	0.50 min
LowLevelFilterNDIR	Off

00954705

Acceptance / Approval

Electronic Signatures

Report Version	User Name	Acceptance	Reason	Date

Report History

Report History

Report Version	User Name	System Reason	User Reason	Date
1	Fusion1 (Fusion1)	Schedule completed	Schedule completed	2018/11/29 20:38

00954706

StarLIMS Run: 616903

Analysis: TIC

Method: SM 5310 C

CCV: 11-GEN-05-72A 25 ppm LCS: 11-GEN-05-73B 25 ppm

ICAL Date: 11/20/18

ICAL ID: 11-GEN-05-72D

Spike ID: 11-GEN-05-67A 0.25 ml of 1000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

21 % H3PO4: 11-GEN-05-73A

Equipment ID: K-TOC-03

PIPETTE ID: N11314F, Marge

FILTER ID: NA

Analyzed By: CES	Date Analyzed: 11/29/18
Reviewed By: [signature]	Date Reviewed:

Work Request # (Original ______) K1810165, 0356, 0308, 0413, 0576, 0821, 0340, 0382, 0494, 0527, 0977, 0334, 0387

Tier: IV II II II II IV IV IV IV IV IV IV IV

Date Analyzed: 11/12/18

Analyst: CES

Run # TOC: 614837, 614838 DOC: 614839

Analysis: TOC / DOC

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA — yes
2.	Holding times met for all analyses and for all samples?	yes/no/NA — yes
3.	Are calculations correct?	yes/no/NA — yes
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA — yes
5.	All quality control criteria met?	yes/no — no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA — yes
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA — yes
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA — yes
9.	Are results for methods blanks all ND?	yes/no/NA — yes
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA — no
11.	Are all exceptions explained?	yes/no/NA — yes
12.	Have all applicable service requests been reviewed?	yes/no/NA — yes
13.	Are all samples labeled correctly?	yes/no/NA — yes
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA — yes
15.	Are detection limits and units reported correctly?	yes/no/NA — yes
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA — yes
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA — no

COMMENTS:

0382-3, 0308-2, 0494-2 → 7 RPD is not within acceptance limits. The sample results are less than 5x the MRL.
0334-3 RPD not within acceptance limits - foamy non homogeneous sample.
RA 0340-3,5,6, 0527-3 - RPD; RA 0340-1, 0413-4 - carry over.
RA 0387-3 over diluted.

Final Approved by: [signature] Date: 11/16/18

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 614837 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1810165-006	Carbon, Total Organic	N/A		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/12/18 22:56	N	IV
1810308-002	Carbon, Total Organic	N/A		Water	2.49 mg/L	10 ml	2.49 mg/L	1	0.07	0.50			11/13/18 02:07	N	II
1810340-001	Carbon, Total Organic	N/A		Water	4.64 mg/L	10 ml	93 mg/L	20	2	10			11/13/18 09:03	N	IV
1810340-002	Carbon, Total Organic	N/A		Water	17.22 mg/L	10 ml	17.2 mg/L	1	0.07	0.50			11/13/18 10:23	N	IV
1810340-003	Carbon, Total Organic	N/A		Water	1.23 mg/L	10 ml	61 mg/L	50	4	25			11/13/18 11:28	N	IV
1810340-004	Carbon, Total Organic	N/A		Water	4.11 mg/L	10 ml	41.1 mg/L	10	0.7	5.0			11/13/18 12:31	N	IV
1810340-005	Carbon, Total Organic	N/A		Water	1.04 mg/L	10 ml	21 mg/L	20	2	10			11/13/18 13:35	N	IV
1810340-006	Carbon, Total Organic	N/A		Water	1.23 mg/L	10 ml	12.3 mg/L	10	0.7	5.0			11/13/18 14:38	N	IV
1810356-001	Carbon, Total Organic	N/A		Water	20.46 mg/L	10 ml	20.5 mg/L	1	0.07	0.50			11/13/18 00:32	N	II
1810382-001	Carbon, Total Organic	N/A		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 15:41	N	IV
K1810382-002	Carbon, Total Organic	N/A		Ground Water	1.75 mg/L	10 ml	1.75 mg/L	1	0.07	0.50			11/13/18 17:52	N	IV
K1810382-003	Carbon, Total Organic	N/A		Ground Water	0.39 mg/L	10 ml	0.39 mg/L J	1	0.07	0.50			11/13/18 18:24	N	IV
K1810413-001	Carbon, Total Organic	N/A		Water	3.07 mg/L	10 ml	3.07 mg/L	1	0.07	0.50			11/13/18 02:39	N	II
K1810413-002	Carbon, Total Organic	N/A		Water	9.32 mg/L	10 ml	9.32 mg/L	1	0.07	0.50			11/13/18 03:43	N	II
K1810413-003	Carbon, Total Organic	N/A		Water	9.13 mg/L	10 ml	9.13 mg/L	1	0.07	0.50			11/13/18 04:15	N	II
K1810413-004	Carbon, Total Organic	N/A		Water	3.60 mg/L	10 ml	3.60 mg/L	1	0.07	0.50			11/13/18 04:47	N	II
K1810576-007	Carbon, Total Organic	N/A		Water	9.79 mg/L	10 ml	19.6 mg/L	2	0.2	1.0			11/13/18 05:18	N	II
K1810821-001	Carbon, Total Organic	N/A		Water	0.16 mg/L	10 ml	0.16 mg/L J	1	0.07	0.50			11/13/18 07:28	N	IV
KQ1816883-01	Carbon, Total Organic	MS	K1810165-006	Water	26.23 mg/L	10 ml	26.2 mg/L	1	0.07	0.50	105		11/12/18 23:28	N	IV
KQ1816883-02	Carbon, Total Organic	DMS	K1810165-006	Water	25.25 mg/L	10 ml	25.2 mg/L	1	0.07	0.50	101	4	11/12/18 23:28	N	IV
KQ1816883-03	Carbon, Total Organic	DUP	K1810165-006	Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	11/12/18 22:56	N	IV
KQ1816883-04	Carbon, Total Organic	DUP	K1810356-001	Water	21.27 mg/L	10 ml	21.3 mg/L	1	0.07	0.50		4	11/13/18 00:32	N	II
KQ1816883-05	Carbon, Total Organic	DUP	K1810308-002	Water	1.90 mg/L	10 ml	1.90 mg/L	1	0.07	0.50		27*	11/13/18 02:07	N	II
KQ1816883-06	Carbon, Total Organic	MS	K1810413-001	Water	30.06 mg/L	10 ml	30.1 mg/L	1	0.07	0.50	108		11/13/18 03:10	N	II
KQ1816883-07	Carbon, Total Organic	DUP	K1810413-001	Water	3.21 mg/L	10 ml	3.21 mg/L	1	0.07	0.50		4	11/13/18 02:39	N	II
KQ1816883-08	Carbon, Total Organic	DUP	K1810413-002	Water	8.91 mg/L	10 ml	8.91 mg/L	1	0.07	0.50		5	11/13/18 03:43	N	II
KQ1816883-09	Carbon, Total Organic	DUP	K1810413-003	Water	8.59 mg/L	10 ml	8.59 mg/L	1	0.07	0.50		6	11/13/18 04:15	N	II
KQ1816883-10	Carbon, Total Organic	DUP	K1810413-004	Water	3.18 mg/L	10 ml	3.18 mg/L	1	0.07	0.50		12*	11/13/18 04:47	N	II
KQ1816883-11	Carbon, Total Organic	DUP	K1810576-007	Water	9.44 mg/L	10 ml	18.9 mg/L	2	0.2	1.0		4	11/13/18 05:18	N	II
KQ1816883-12	Carbon, Total Organic	MS	K1810821-001	Water	27.76 mg/L	10 ml	27.8 mg/L	1	0.07	0.50	110		11/13/18 08:30	N	IV
KQ1816883-13	Carbon, Total Organic	DUP	K1810821-001	Water	0.03 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	11/13/18 07:28	N	IV
KQ1816883-14	Carbon, Total Organic	TRP	K1810821-001	Water	0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	11/13/18 07:28	N	IV
KQ1816883-15	Carbon, Total Organic	QUAD	K1810821-001	Water	0.10 mg/L	10 ml	0.1 mg/L J	1	0.07	0.50		NC	11/13/18 07:28	N	IV
KQ1816883-16	Carbon, Total Organic	MS	K1810340-001	Water	35.85 mg/L	10 ml	717 mg/L	20	2	10	125*		11/13/18 09:35	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

11/16/18 CES 11/16/18

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 614837 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1816883-17	Carbon, Total Organic	DUP	K1810340-001	Water	4.77 mg/L	10 ml	95 mg/L	20	2	10		3	11/13/18 09:03	N	IV
KQ1816883-18	Carbon, Total Organic	DUP	K1810340-002	Water	16.39 mg/L	10 ml	16.4 mg/L	1	0.07	0.50		5	11/13/18 10:23	N	IV
KQ1816883-19	Carbon, Total Organic	DUP	K1810340-003	Water	1.46 mg/L	10 ml	73 mg/L	50	4	25		17*	11/13/18 11:28	N	IV
KQ1816883-20	Carbon, Total Organic	DUP	K1810340-004	Water	4.49 mg/L	10 ml	44.9 mg/L	10	0.7	5.0		9	11/13/18 12:31	N	IV
KQ1816883-21	Carbon, Total Organic	DUP	K1810340-005	Water	0.87 mg/L	10 ml	17 mg/L	20	2	10		18*	11/13/18 13:35	N	IV
KQ1816883-22	Carbon, Total Organic	DUP	K1810340-006	Water	1.64 mg/L	10 ml	16.4 mg/L	10	0.7	5.0		29*	11/13/18 14:38	N	IV
KQ1816883-23	Carbon, Total Organic	MS	K1810382-001	Ground Water	27.15 mg/L	10 ml	27.2 mg/L	1	0.07	0.50	109		11/13/18 16:13	N	IV
KQ1816883-24	Carbon, Total Organic	DUP	K1810382-001	Ground Water	0.78 mg/L	10 ml	0.78 mg/L	1	0.07	0.50		NC	11/13/18 15:41	N	IV
KQ1816883-25	Carbon, Total Organic	DUP	K1810382-002	Ground Water	1.60 mg/L	10 ml	1.60 mg/L	1	0.07	0.50		9	11/13/18 17:52	N	IV
KQ1816883-26	Carbon, Total Organic	DUP	K1810382-003	Ground Water	0.25 mg/L	10 ml	0.25 mg/L J	1	0.07	0.50		45*	11/13/18 18:24	N	IV
KQ1816883-27	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/12/18 20:31	N	IV
KQ1816883-27	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/12/18 20:31	N	IV
KQ1816883-28	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 06:23	N	IV
KQ1816883-28	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 06:23	N	IV
KQ1816883-29	Carbon, Total Organic	LCS		Water	22.30 mg/L	10 ml	22.3 mg/L	1	0.07	0.50	102		11/12/18 20:47	N	IV
KQ1816883-29	Carbon, Total Organic	LCS		Water	22.30 mg/L	10 ml	22.3 mg/L	1	0.07	0.50	102		11/12/18 20:47	N	IV
KQ1816883-30	Carbon, Total Organic	LCS		Water	21.47 mg/L	10 ml	21.5 mg/L	1	0.07	0.50	98		11/13/18 06:39	N	IV
KQ1816883-30	Carbon, Total Organic	LCS		Water	21.47 mg/L	10 ml	21.5 mg/L	1	0.07	0.50	98		11/13/18 06:39	N	IV
KQ1816883-31	Carbon, Total Organic	CCV		Water	25.54 mg/L	10 ml	25.5 mg/L	1			102		11/12/18 19:57	N	IV
KQ1816883-31	Carbon, Total Organic	CCV		Water	25.54 mg/L	10 ml	25.5 mg/L	1			102		11/12/18 19:57	N	IV
KQ1816883-32	Carbon, Total Organic	CCV		Water	25.14 mg/L	10 ml	25.1 mg/L	1			100		11/12/18 23:59	N	IV
KQ1816883-32	Carbon, Total Organic	CCV		Water	25.14 mg/L	10 ml	25.1 mg/L	1			100		11/12/18 23:59	N	IV
KQ1816883-33	Carbon, Total Organic	CCV		Water	25.13 mg/L	10 ml	25.1 mg/L	1			100		11/13/18 05:50	N	IV
KQ1816883-33	Carbon, Total Organic	CCV		Water	25.13 mg/L	10 ml	25.1 mg/L	1			100		11/13/18 05:50	N	IV
KQ1816883-34	Carbon, Total Organic	CCV		Water	25.01 mg/L	10 ml	25.0 mg/L	1			100		11/13/18 10:54	N	IV
KQ1816883-34	Carbon, Total Organic	CCV		Water	25.01 mg/L	10 ml	25.0 mg/L	1			100		11/13/18 10:54	N	IV
KQ1816883-35	Carbon, Total Organic	CCV		Water	25.07 mg/L	10 ml	25.1 mg/L	1			100		11/13/18 16:30	N	IV
KQ1816883-35	Carbon, Total Organic	CCV		Water	25.07 mg/L	10 ml	25.1 mg/L	1			100		11/13/18 16:30	N	IV
KQ1816883-36	Carbon, Total Organic	CCV		Water	25.54 mg/L	10 ml	25.5 mg/L	1			102		11/13/18 21:03	N	IV
KQ1816883-36	Carbon, Total Organic	CCV		Water	25.54 mg/L	10 ml	25.5 mg/L	1			102		11/13/18 21:03	N	IV
KQ1816883-37	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/12/18 20:14	N	IV
KQ1816883-37	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/12/18 20:14	N	IV
KQ1816883-38	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 00:16	N	IV
KQ1816883-38	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 00:16	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 614837 **Method/Testcode:** 9060/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1816883-39	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 06:06	N	IV
KQ1816883-39	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 06:06	N	IV
KQ1816883-40	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 11:11	N	IV
KQ1816883-40	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 11:11	N	IV
KQ1816883-41	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 16:46	N	IV
KQ1816883-41	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 16:46	N	IV
KQ1816883-42	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 21:20	N	IV
KQ1816883-42	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 21:20	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 614838 **Method/Testcode:** SM 5310 C/TOC T

Lab Cod	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1810494-001	Carbon, Total Organic	N/A		Water	1.01 mg/L	10 ml	1.01 mg/L	1	0.07	0.50			11/13/18 18:55	N	IV
K1810494-002	Carbon, Total Organic	N/A		Water	1.01 mg/L	10 ml	1.01 mg/L	1	0.07	0.50			11/13/18 19:27	Y	IV
K1810494-003	Carbon, Total Organic	N/A		Water	0.95 mg/L	10 ml	0.95 mg/L	1	0.07	0.50			11/13/18 20:32	N	IV
K1810494-004	Carbon, Total Organic	N/A		Water	1.33 mg/L	10 ml	1.33 mg/L	1	0.07	0.50			11/13/18 21:36	N	IV
K1810494-005	Carbon, Total Organic	N/A		Water	0.70 mg/L	10 ml	0.70 mg/L	1	0.07	0.50			11/13/18 22:08	N	IV
K1810494-006	Carbon, Total Organic	N/A		Water	0.84 mg/L	10 ml	0.84 mg/L	1	0.07	0.50			11/13/18 22:40	N	IV
K1810494-007	Carbon, Total Organic	N/A		Water	0.79 mg/L	10 ml	0.79 mg/L	1	0.07	0.50			11/13/18 23:12	N	IV
K1810527-001	Carbon, Total Organic	N/A		Ground Water	3.99 mg/L	10 ml	3.99 mg/L	1	0.07	0.50			11/13/18 23:43	N	IV
K1810527-002	Carbon, Total Organic	N/A		Ground Water	2.86 mg/L	10 ml	2.86 mg/L	1	0.07	0.50			11/14/18 00:47	N	IV
K1810527-003	Carbon, Total Organic	N/A		Ground Water	3.19 mg/L	10 ml	3.19 mg/L	1	0.07	0.50			11/14/18 01:51	N	IV
K1810977-001	Carbon, Total Organic (TOC)	N/A		Water	2.82 mg/L	10 ml	2.82 mg/L	1	0.07	0.50			11/14/18 03:29	N	IV
K1810977-002	Carbon, Total Organic (TOC)	N/A		Water	1.23 mg/L	10 ml	4.9 mg/L	4	0.3	2.0			11/14/18 05:04	N	IV
KQ1816886-01	Carbon, Total Organic	DUP	K1810494-001	Water	0.93 mg/L	10 ml	0.93 mg/L	1	0.07	0.50		8	11/13/18 18:55	N	IV
KQ1816886-02	Carbon, Total Organic	MS	K1810494-002	Water	27.83 mg/L	10 ml	27.8 mg/L	1	0.07	0.50	107		11/13/18 19:59	N	IV
KQ1816886-03	Carbon, Total Organic	DUP	K1810494-002	Water	0.88 mg/L	10 ml	0.88 mg/L	1	0.07	0.50		14*	11/13/18 19:27	N	IV
KQ1816886-04	Carbon, Total Organic	DUP	K1810494-003	Water	0.85 mg/L	10 ml	0.85 mg/L	1	0.07	0.50		11*	11/13/18 20:32	N	IV
KQ1816886-05	Carbon, Total Organic	DUP	K1810494-004	Water	1.19 mg/L	10 ml	1.19 mg/L	1	0.07	0.50		11*	11/13/18 21:36	N	IV
KQ1816886-06	Carbon, Total Organic	DUP	K1810494-005	Water	0.62 mg/L	10 ml	0.62 mg/L	1	0.07	0.50		12*	11/13/18 22:08	N	IV
KQ1816886-07	Carbon, Total Organic	DUP	K1810494-006	Water	0.65 mg/L	10 ml	0.65 mg/L	1	0.07	0.50		26*	11/13/18 22:40	N	IV
KQ1816886-08	Carbon, Total Organic	DUP	K1810494-007	Water	0.56 mg/L	10 ml	0.56 mg/L	1	0.07	0.50		35*	11/13/18 23:12	N	IV
KQ1816886-09	Carbon, Total Organic	MS	K1810527-001	Ground Water	29.14 mg/L	10 ml	29.1 mg/L	1	0.07	0.50	101		11/14/18 00:15	N	IV
KQ1816886-10	Carbon, Total Organic	DUP	K1810527-001	Ground Water	3.42 mg/L	10 ml	3.42 mg/L	1	0.07	0.50		15*	11/13/18 23:43	N	IV
KQ1816886-11	Carbon, Total Organic	DUP	K1810527-002	Ground Water	2.55 mg/L	10 ml	2.55 mg/L	1	0.07	0.50		12*	11/14/18 00:47	N	IV
KQ1816886-12	Carbon, Total Organic	DUP	K1810527-003	Ground Water	2.78 mg/L	10 ml	2.78 mg/L	1	0.07	0.50		14*	11/14/18 01:51	N	IV
KQ1816886-13	Carbon, Total Organic (TOC)	MS	K1810977-001	Water	29.65 mg/L	10 ml	29.7 mg/L	1	0.07	0.50	107		11/14/18 04:32	N	IV
KQ1816886-14	Carbon, Total Organic (TOC)	DUP	K1810977-001	Water	2.79 mg/L	10 ml	2.79 mg/L	1		0.50		<1	11/14/18 03:29	N	IV
KQ1816886-15	Carbon, Total Organic (TOC)	TRP	K1810977-001	Water	2.81 mg/L	10 ml	2.81 mg/L	1		0.50		<1	11/14/18 03:29	N	IV
KQ1816886-16	Carbon, Total Organic (TOC)	QUAD	K1810977-001	Water	3.38 mg/L	10 ml	3.38 mg/L	1		0.50		10	11/14/18 03:29	N	IV
KQ1816886-17	Carbon, Total Organic (TOC)	DUP	K1810977-002	Water	1.17 mg/L	10 ml	4.7 mg/L	4		2.0		5	11/14/18 05:04	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

11/16/18

CES 11/16/18

Printed 11/16/18 13:11

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 614838 **Method/Testcode:** 9060A/TOC T

Lab Cod	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
Q1816886-18	Carbon, Total Organic (TOC)	TRP	K1810977-002	Water	1.09 mg/L	10 ml	4.4 mg/L	4		2.0		6	11/14/18 05:04	N	IV
KQ1816886-19	Carbon, Total Organic (TOC)	QUAD	K1810977-002	Water	1.11 mg/L	10 ml	4.4 mg/L	4		2.0		6	11/14/18 05:04	N	IV
KQ1816886-20	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 17:03	N	IV
KQ1816886-20	Carbon, Total Organic (TOC)	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1		0.50			11/13/18 17:03	N	IV
KQ1816886-21	Carbon, Total Organic	LCS		Water	21.59 mg/L	10 ml	21.6 mg/L	1	0.07	0.50	99		11/13/18 17:19	N	IV
KQ1816886-21	Carbon, Total Organic (TOC)	LCS		Water	21.59 mg/L	10 ml	21.6 mg/L	1		0.50	99		11/13/18 17:19	N	IV
KQ1816886-22	Carbon, Total Organic	CCV		Water	25.07 mg/L	10 ml	25.1 mg/L	1			100		11/13/18 16:30	N	IV
KQ1816886-22	Carbon, Total Organic (TOC)	CCV		Water	25.07 mg/L	10 ml	25.1 mg/L	1			100		11/13/18 16:30	N	IV
KQ1816886-23	Carbon, Total Organic	CCV		Water	25.54 mg/L	10 ml	25.5 mg/L	1			102		11/13/18 21:03	N	IV
KQ1816886-23	Carbon, Total Organic (TOC)	CCV		Water	25.54 mg/L	10 ml	25.5 mg/L	1			102		11/13/18 21:03	N	IV
KQ1816886-24	Carbon, Total Organic	CCV		Water	25.19 mg/L	10 ml	25.2 mg/L	1			101		11/14/18 02:23	N	IV
KQ1816886-24	Carbon, Total Organic (TOC)	CCV		Water	25.19 mg/L	10 ml	25.2 mg/L	1			101		11/14/18 02:23	N	IV
KQ1816886-25	Carbon, Total Organic	CCV		Water	24.90 mg/L	10 ml	24.9 mg/L	1			100		11/14/18 07:59	N	IV
KQ1816886-25	Carbon, Total Organic (TOC)	CCV		Water	24.90 mg/L	10 ml	24.9 mg/L	1			100		11/14/18 07:59	N	IV
KQ1816886-26	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 16:46	N	IV
KQ1816886-26	Carbon, Total Organic (TOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1		0.50			11/13/18 16:46	N	IV
KQ1816886-27	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/13/18 21:20	N	IV
KQ1816886-27	Carbon, Total Organic (TOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1		0.50			11/13/18 21:20	N	IV
KQ1816886-28	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/14/18 02:39	N	IV
KQ1816886-28	Carbon, Total Organic (TOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1		0.50			11/14/18 02:39	N	IV
KQ1816886-29	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/14/18 08:15	N	IV
KQ1816886-29	Carbon, Total Organic (TOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1		0.50			11/14/18 08:15	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 614839 **Method/Testcode:** SM 5310 C/TOC D

b Cod	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1810334-002	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.05 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/14/18 06:39	N	IV
1810334-003	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	1.39 mg/L	10 ml	5.6 mg/L	4	0.3	2.0			11/14/18 07:27	N	IV
1810334-004	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	4.79 mg/L	10 ml	4.79 mg/L	1	0.07	0.50			11/14/18 08:32	N	IV
K1810334-005	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	1.96 mg/L	10 ml	7.9 mg/L	4	0.3	2.0			11/14/18 09:04	N	IV
K1810334-006	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	2.82 mg/L	10 ml	5.6 mg/L	2	0.2	1.0			11/14/18 09:35	N	IV
K1810387-002	Carbon, Dissolved Organic (DOC)	N/A		Water	1.38 mg/L	10 ml	1.38 mg/L	1	0.07	0.50			11/14/18 10:39	N	IV
K1810387-003	Carbon, Dissolved Organic (DOC)	N/A		Water	0.33 mg/L	10 ml	1.3 mg/L J	4	0.3	2.0			11/14/18 11:43	N	IV
KQ1816898-01	Carbon, Dissolved Organic (DOC)	MS	K1810334-002	Ground Water	26.75 mg/L	10 ml	26.8 mg/L	1	0.07	0.50	107		11/14/18 07:11	N	IV
KQ1816898-02	Carbon, Dissolved Organic (DOC)	DUP	K1810334-002	Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	11/14/18 06:39	N	IV
KQ1816898-03	Carbon, Dissolved Organic (DOC)	DUP	K1810334-003	Ground Water	1.14 mg/L	10 ml	4.5 mg/L	4	0.3	2.0		20*	11/14/18 07:27	N	IV
KQ1816898-04	Carbon, Dissolved Organic (DOC)	DUP	K1810334-004	Ground Water	4.66 mg/L	10 ml	4.66 mg/L	1	0.07	0.50		3	11/14/18 08:32	N	IV
KQ1816898-05	Carbon, Dissolved Organic (DOC)	DUP	K1810334-005	Ground Water	1.81 mg/L	10 ml	7.2 mg/L	4	0.3	2.0		8	11/14/18 09:04	N	IV
KQ1816898-06	Carbon, Dissolved Organic (DOC)	DUP	K1810334-006	Ground Water	2.80 mg/L	10 ml	5.6 mg/L	2	0.2	1.0		<1	11/14/18 09:35	N	IV
KQ1816898-07	Carbon, Dissolved Organic (DOC)	MS	K1810387-002	Water	28.28 mg/L	10 ml	28.3 mg/L	1	0.07	0.50	108		11/14/18 11:10	N	IV
KQ1816898-08	Carbon, Dissolved Organic (DOC)	DUP	K1810387-002	Water	1.34 mg/L	10 ml	1.34 mg/L	1	0.07	0.50		3	11/14/18 10:39	N	IV
KQ1816898-09	Carbon, Dissolved Organic (DOC)	DUP	K1810387-003	Water	0.24 mg/L	10 ml	1.0 mg/L J	4	0.3	2.0		33*	11/14/18 11:43	N	IV
KQ1816898-10	Carbon, Dissolved Organic (DOC)	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/14/18 02:56	N	IV
KQ1816898-11	Carbon, Dissolved Organic (DOC)	LCS		Ground Water	21.04 mg/L	10 ml	21.0 mg/L	1	0.07	0.50	96		11/14/18 03:12	N	IV
KQ1816898-12	Carbon, Dissolved Organic (DOC)	CCV		Ground Water	25.19 mg/L	10 ml	25.2 mg/L	1			101		11/14/18 02:23	N	IV
KQ1816898-13	Carbon, Dissolved Organic (DOC)	CCV		Ground Water	24.90 mg/L	10 ml	24.9 mg/L	1			100		11/14/18 07:59	N	IV
KQ1816898-14	Carbon, Dissolved Organic (DOC)	CCV		Ground Water	24.57 mg/L	10 ml	24.6 mg/L	1			98		11/14/18 12:47	N	IV
KQ1816898-15	Carbon, Dissolved Organic (DOC)	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/14/18 02:39	N	IV
KQ1816898-16	Carbon, Dissolved Organic (DOC)	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/14/18 08:15	N	IV

11/16/18

\# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

CES 11/16/18

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 614839 **Method/Testcode:** SM 5310 C/TOC D

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1816898-17	Carbon, Dissolved Organic (DOC)	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/14/18 13:03	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

TOC: 614837,
614838
DOC: 614839

Schedule: 11122018

Version: 10
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2018/11/12 20:53 - Monday

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps
(Clean)	Clean	Clean		1
(Clean)	Clean	Clean		1
(Clean)	Clean	Clean		1
(Blank)	Blank	Reagent/Acid Blank		1
D	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
1	Sample	MB1	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
3	Sample	ICS	Extended Reaction 021711 (Extended Reaction 021711)	1
4	Sample	RB1	Extended Reaction 021711 (Extended Reaction 021711)	2
5	Sample	RB2	Extended Reaction 021711 (Extended Reaction 021711)	2
6	Sample	LOD	Extended Reaction 021711 (Extended Reaction 021711)	1
7	Sample	LOQ	Extended Reaction 021711 (Extended Reaction 021711)	1
8	Sample	K1810165-006.06	Extended Reaction 021711 (Extended Reaction 021711)	2
9	Sample	K1810165-006.06 ms/msd	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
10	Sample	K1810356-001.01	Extended Reaction 021711 (Extended Reaction 021711)	2
11	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	4
12	Sample	K1810308-002.05	Extended Reaction 021711 (Extended Reaction 021711)	2
13	Sample	K1810413-001.04	Extended Reaction 021711 (Extended Reaction 021711)	2
14	Sample	K1810413-001.04 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
15	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
16	Sample	K1810413-002.03	Extended Reaction 021711 (Extended Reaction 021711)	2
17	Sample	K1810413-003.03	Extended Reaction 021711 (Extended Reaction 021711)	2
18	Sample	K1810413-004.03	Extended Reaction 021711 (Extended Reaction 021711)	2
19	Sample	K1810576-007.11 2x	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
20	Sample	MB2	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
21	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
22	Sample	K1810821-001.04	Extended Reaction 021711 (Extended Reaction 021711)	4
23	Sample	K1810821-001.04 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
24	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
25	Sample	K1810340-001.01 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
26	Sample	K1810340-001.01 ms 20x	Extended Reaction 021711 (Extended Reaction 021711)	1
27	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
28	Sample	K1810340-002.01	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
29	Sample	K1810340-003.01 50x	Extended Reaction 021711 (Extended Reaction 021711)	2
30	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
31	Sample	K1810340-004.01 10x	Extended Reaction 021711 (Extended Reaction 021711)	2
32	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
33	Sample	K1810340-005.01 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
34	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
35	Sample	K1810340-006.01 10x	Extended Reaction 021711 (Extended Reaction 021711)	2
36	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
37	Sample	K1810382-001.06	Extended Reaction 021711 (Extended Reaction 021711)	2
38	Sample	K1810382-001.06 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1

11/16/18

Schedule: 11122018

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps
39	Sample	MB3	Extended Reaction 021711 (Extended Reaction 021711)	1
^	~~Check Standard~~	~~[TOC] LCS ER [21.9 ppm]~~	~~Extended Reaction 021711 (Extended Reaction 021711)~~	~~1~~
40	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
41	Sample	K1810382-002.06	Extended Reaction 021711 (Extended Reaction 021711)	2
42	Sample	K1810382-003.06	Extended Reaction 021711 (Extended Reaction 021711)	2
43	Sample	K1810494-001.06	Extended Reaction 021711 (Extended Reaction 021711)	2
44	Sample	K1810494-002.07	Extended Reaction 021711 (Extended Reaction 021711)	2
45	Sample	K1810494-002.07 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
46	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
47	Sample	K1810494-003.06	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
48	Sample	K1810494-004.06	Extended Reaction 021711 (Extended Reaction 021711)	2
49	Sample	K1810494-005.06	Extended Reaction 021711 (Extended Reaction 021711)	2
50	Sample	K1810494-006.06	Extended Reaction 021711 (Extended Reaction 021711)	2
51	Sample	K1810494-007.06	Extended Reaction 021711 (Extended Reaction 021711)	2
52	Sample	K1810527-001.01	Extended Reaction 021711 (Extended Reaction 021711)	2
53	Sample	K1810527-001.01 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
54	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
55	Sample	K1810527-002.03	Extended Reaction 021711 (Extended Reaction 021711)	2
56	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
57	Sample	K1810527-003.01	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
58	Sample	MB4	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
59	Sample	K1810977-001.01	Extended Reaction 021711 (Extended Reaction 021711)	4
60	Sample	K1810977-001.01 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
61	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
62	Sample	K1810977-002.02 4x	Extended Reaction 021711 (Extended Reaction 021711)	4
63	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
64	Sample	K1810334-002.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
65	Sample	K1810334-002.02 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
66	Sample	K1810334-003.02 doc 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
67	Sample	K1810334-004.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
68	Sample	K1810334-005.04 doc 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
69	Sample	K1810334-006.02 doc 2x	Extended Reaction 021711 (Extended Reaction 021711)	2
70	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
71	Sample	K1810387-002.12 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
72	Sample	K1810387-002.12 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
73	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
74	Sample	K1810387-003.12 doc 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
75	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
C	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1

Fusion Report - 11122018
Monday, November 12, 2018 05:23 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2018/11/14 15:01 - Wednesday

Report Summary Information

Company Location:	Gen Chem Lab
Schedule Name:	11122018
Instrument Name:	Fusion1
Report Version:	1 of 1
Report Creation by Operators (schedule version):	Fusion1 (Fusion1) (v1) Fusion1 (Fusion1) (v2) Fusion1 (Fusion1) (v4) Fusion1 (Fusion1) (v5) Fusion1 (Fusion1) (v6) Fusion1 (Fusion1) (v8) Fusion1 (Fusion1) (v9) Fusion1 (Fusion1) (v10)
Comment:	

Engine Version:	1.1.5.1
Firmware Version:	1.2.0696
Connection:	RS232 COM1

~~11/16/18~~
11/16/18

Report Results

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/12 17:23

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	13.60	16.28	2.68	49.61	05:29
2	TC Clean	24.30	27.11	2.81	49.80	07:17
3	TC Clean	4.47	7.06	2.58	49.83	07:02
4	TC Clean	2.39	5.09	2.70	49.88	07:02

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/12 17:54

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.91	3.46	2.55	49.56	05:16

2	TC Clean	6.13	8.82	2.69	49.79	07:19
3	TC Clean	3.22	5.77	2.55	49.87	07:01
4	TC Clean	2.54	5.29	2.75	49.83	07:04

ample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/11/12 18:26

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	1.00	3.39	2.39	49.53	05:23
2	TC Clean	7.97	10.75	2.78	49.81	07:17
3	TC Clean	3.92	6.49	2.57	49.83	07:03
4	TC Clean	4.17	6.85	2.68	49.86	07:01

Sample Type: Blank (Creating v1180) — From Schedule Version 2

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2018/11/12 18:58

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	7.38	9.78	2.39	49.46	05:17
2	TC Clean	7.51	10.32	2.81	49.88	07:18
3	TC Clean	2.55	5.34	2.79	49.93	07:02
4	TC Clean	2.59	5.39	2.79	50.08	03:51
5	Reagent Blank	5.89	8.52	2.62	49.84	08:11
6	Acid Blank	1.30	3.78	2.48	49.49	05:30

Sample Type: Sample — From Schedule Version 4

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	1.8846 ppm	0.0000 ppm	0.0000%	2018/11/12 19:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.8846	18.8462	37.50	40.76	3.26	49.96	12:35

Dilution **Blank Contribution** **Method** **Calibration**

00954719

1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 — From Schedule Version 5

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	25.5440 ppm (PASS)	0.0000 ppm	0%	2018/11/12 19:57

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.5440	255.4397	204.36	207.18	2.82	49.96	12:32

Completion State	**Success Action**	**Method**	**Calibration**	**STD Conc - Pos B**
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 — From Schedule Version 6

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/12 20:14

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	23.38	26.12	2.74	50.02	12:33

Completion State	**Success Action**	**Method**	**Calibration**	**STD Conc - Pos D**
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Sample Type: Sample — From Schedule Version 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	TOC	MB1	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/12 20:31

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	21.03	23.76	2.73	49.97	12:29

Dilution	**Blank Contribution**	**Method**	**Calibration**
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> LCS ER — From Schedule Version 9

	Pos	BAT	Concentration	Dil	Sample ID	Min / Max	Result	Std. Dev.	RSD	Start Time

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			(ppm)			(% dev)				
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	22.2977 ppm (PASS)	0.0000 ppm	0%	2018/11/12 20:47

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	22.2977	222.9767	181.78	184.64	2.86	49.93	12:35

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	21.9 ppmC

Sample Type: Sample

From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	ICS	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/12 21:03

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	24.08	26.82	2.74	49.95	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	RB1	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/12 21:20

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	20.68	23.52	2.84	50.00	12:26
2	TOC	0.0000	0.0000	20.81	23.68	2.87	49.96	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	RB2	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/12 21:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	20.58	23.31	2.74	49.95	12:25
2	TOC	0.0000	0.0000	19.89	22.68	2.79	49.97	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	LOD	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/12 22:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	22.06	24.91	2.84	50.02	12:34

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TOC	LOQ	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/12 22:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	24.09	26.86	2.77	50.17	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1810165-006.06	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/12 22:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	19.74	22.54	2.80	50.11	12:23
2	TOC	0.0000	0.0000	19.56	22.32	2.75	50.16	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1810165-006.06 ms/msd	25.7398 ppm	0.6989 ppm	2.7200%	2018/11/12 23:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.2340	262.3404	206.89	209.78	2.89	50.19	12:27
2	TOC	25.2456	252.4562	200.01	202.75	2.74	50.16	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	25.1369 ppm (PASS)	0.0000 ppm	0%	2018/11/12 23:59

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time

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B	TOC	25 ppm	1	25.1369	251.3687	201.53	204.44	2.91	50.17	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/13 00:16

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	20.93	23.61	2.67	50.23	12:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Sample Type: Sample From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	TOC	K1810356-001.01	20.8612 ppm	0.5742 ppm	2.7500%	2018/11/13 00:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	20.4552	204.5517	166.69	169.37	2.68	50.20	12:29
2	TOC	21.2672	212.6721	172.34	174.97	2.63	50.19	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	11	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 01:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	23.06	26.09	3.03	50.23	12:29
2	TOC	0.0000	0.0000	21.55	24.52	2.97	50.17	12:26
3	TOC	0.0000	0.0000	20.16	23.02	2.86	50.24	12:27
4	TOC	0.0000	0.0000	19.96	22.85	2.89	50.18	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	12	TOC	K1810308-002.05	2.1926 ppm	0.4203 ppm	19.1700%	2018/11/13 02:07

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Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.4898	24.8981	41.71	44.62	2.91	50.19	12:27
2	TOC	1.8954	18.9540	37.58	40.47	2.89	50.20	12:27

Dilution	Blank Contribution	Method	Calibration
0	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	13	TOC	K1810413-001.04	3.1421 ppm	0.0973 ppm	3.1000%	2018/11/13 02:39

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.0733	30.7329	45.77	48.53	2.76	50.17	12:27
2	TOC	3.2109	32.1085	46.73	49.71	2.98	50.25	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	14	TOC	K1810413-001.04 ms	30.0589 ppm	0.0000 ppm	0.0000%	2018/11/13 03:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	30.0589	300.5892	233.50	236.49	2.99	50.20	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	15	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 03:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	19.63	22.41	2.78	50.19	12:35

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	16	TOC	K1810413-002.03	9.1140 ppm	0.2937 ppm	3.2200%	2018/11/13 03:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	9.3216	93.2164	89.24	92.18	2.94	50.26	12:26
2	TOC	8.9063	89.0635	86.35	89.23	2.88	50.19	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

		Analysis			Std. Dev.		

	Pos	Type	Sample ID	Result (ppmC)	(ppmC)	RSD	Start Time
◈	17	TOC	K1810413-003.03	8.8575 ppm	0.3838 ppm	4.3300%	2018/11/13 04:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	9.1289	91.2887	87.90	90.73	2.84	50.20	12:28
~~2~~	~~TOC~~	~~8.5861~~	~~85.8607~~	~~84.12~~	~~86.99~~	~~2.87~~	~~50.24~~	~~12:2~~

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	18	TOC	K1810413-004.03	3.3938 ppm	0.2962 ppm	8.7300%	2018/11/13 04:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.6033	36.0329	49.46	52.41	2.95	50.21	12:23
2	TOC	3.1844	31.8440	46.54	49.37	2.83	50.25	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	19	TOC	K1810576-007.11 2x	9.6149 ppm	0.2468 ppm	2.5700%	2018/11/13 05:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	9.7894	97.8940	92.49	95.48	2.99	50.23	12:28
2	TOC	9.4404	94.4038	90.06	92.88	2.82	50.20	12:22

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	25.1280 ppm (PASS)	0.0000 ppm	0%	2018/11/13 05:50

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.1280	251.2796	201.47	204.31	2.84	50.24	12:33

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/13 06:06

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	19.84	22.83	2.99	50.22	12:29

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Sample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 06:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	20.22	23.04	2.82	50.21	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> LCS ER — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	21.4665 ppm (PASS)	0.0000 ppm	0%	2018/11/13 06:39

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	21.4665	214.6652	176.00	178.98	2.99	50.26	12:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	21.9 ppmC

Sample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 06:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	19.82	22.70	2.88	50.22	12:26

2	TOC	0.0000	0.0000	19.54	22.41	2.87	50.18	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	22	TOC	K1810821-001.04	0.0835 ppm	0.0597 ppm	71.5000%	2018/11/13 07:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.1618	1.6179	25.52	28.44	2.92	50.26	12:24
2	TOC	0.0308	0.3083	24.60	27.48	2.87	50.21	12:26
3	TOC	0.0436	0.4362	24.69	27.66	2.97	50.23	12:26
4	TOC	0.0978	0.9782	25.07	27.81	2.74	50.19	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	23	TOC	K1810821-001.04 ms	27.7566 ppm	0.0000 ppm	0.0000%	2018/11/13 08:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.7566	277.5663	217.48	220.31	2.83	50.14	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	24	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 08:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	20.87	23.80	2.92	50.20	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	25	TOC	K1810340-001.01 20x	4.7064 ppm	0.0921 ppm	1.9600%	2018/11/13 09:03

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.6413	46.4130	56.68	59.50	2.82	50.17	12:25
2	TOC	4.7715	47.7154	57.58	60.36	2.78	50.19	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

◈	26	TOC	K1810340-001.01 ms 20x	35.8461 ppm	0.0000 ppm	0.0000%	2018/11/13 09:35

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	35.8461	358.4613	273.76	277.06	3.31	50.18	12:33

ilution	Blank Contribution	Method	Calibratio
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	27	TOC	RB	0.1000 ppm	0.1414 ppm	141.4200%	2018/11/13 09:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2000	2.0002	25.78	28.79	3.01	50.13	12:24
2	TOC	0.0000	0.0000	21.23	23.98	2.74	50.09	12:22

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	28	TOC	K1810340-002.01	16.8057 ppm	0.5886 ppm	3.5000%	2018/11/13 10:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	17.2220	172.2196	144.20	147.03	2.84	50.12	12:23
2	TOC	16.3895	163.8951	138.40	141.24	2.83	50.07	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	25.0112 ppm (PASS)	0.0000 ppm	0%	2018/11/13 10:54

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.0112	250.1123	200.66	203.49	2.83	50.10	12:29

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration	Dil	Sample ID	Min / Max	Result	Std. Dev.	RSD	Start Time

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			(ppm)			(% dev)				
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/13 11:11

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Tim-
D	TOC	0.0 ppm	1	0.0000	0.0000	21.55	24.53	2.98	50.08	12:29

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Sample Type: Sample

From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	29	TOC	K1810340-003.01 50x	1.3423 ppm	0.1602 ppm	11.9300%	2018/11/13 11:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2290	12.2898	32.94	35.86	2.92	50.08	12:28
2	TOC	1.4555	14.5553	34.52	37.25	2.73	50.07	12:22

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	30	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 11:59

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	23.68	26.39	2.70	50.12	12:25
2	TOC	0.0000	0.0000	20.51	23.47	2.96	50.15	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	31	TOC	K1810340-004.01 10x	4.2998 ppm	0.2678 ppm	6.2300%	2018/11/13 12:31

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.1104	41.1044	52.98	55.76	2.78	50.18	12:29
2	TOC	4.4892	44.8922	55.62	58.29	2.67	50.19	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	32	TOC	RB	0.0264 ppm	0.0374 ppm	141.4200%	2018/11/13 13:03

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Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0528	0.5282	24.76	27.65	2.89	50.19	12:30
2	TOC	0.0000	0.0000	21.44	24.33	2.89	50.20	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reactio 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	33	TOC	K1810340-005.01 20x	0.9572 ppm	0.1213 ppm	12.6700%	2018/11/13 13:35

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0430	10.4297	31.65	34.56	2.92	50.22	12:24
2	TOC	0.8715	8.7148	30.45	33.35	2.90	50.22	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	34	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 14:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	20.34	23.16	2.82	50.21	12:25
2	TOC	0.0000	0.0000	20.05	22.90	2.85	50.21	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	35	TOC	K1810340-006.01 10x	1.4348 ppm	0.2940 ppm	20.4900%	2018/11/13 14:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2270	12.2697	32.93	35.67	2.74	50.21	12:26
2	TOC	1.6427	16.4269	35.82	38.55	2.73	50.22	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	36	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 15:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	19.63	22.54	2.91	50.25	12:25
2	TOC	0.0000	0.0000	19.21	21.97	2.76	50.24	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC)	Extended Reaction	Extended Reaction

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(v1180) 021711 (v3) 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	37	TOC	K1810382-001.06	0.3879 ppm	0.5485 ppm	141.4200%	2018/11/13 15:41

Re #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	24.22	26.97	2.75	50.24	12:27
2	TOC	0.7757	7.7574	29.79	32.64	2.85	50.23	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	38	TOC	K1810382-001.06 ms	27.1507 ppm	0.0000 ppm	0.0000%	2018/11/13 16:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.1507	271.5073	213.27	216.05	2.79	50.27	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	25.0671 ppm (PASS)	0.0000 ppm	0%	2018/11/13 16:30

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.0671	250.6715	201.04	203.91	2.86	50.28	12:27

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/13 16:46

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	20.33	23.10	2.77	50.31	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

ample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	39	TOC	MB3	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 17:03

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	19.34	22.21	2.87	50.35	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> LCS ER — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	21.5919 ppm (PASS)	0.0000 ppm	0%	2018/11/13 17:19

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	21.5919	215.9186	176.87	179.80	2.93	50.26	12:33

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	21.9 ppmC

Sample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	40	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 17:36

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	20.59	23.47	2.88	50.24	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	41	TOC	K1810382-002.06	1.6753 ppm	0.1087 ppm	6.4900%	2018/11/13 17:52

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

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1	TOC	1.7521	17.5209	36.58	39.25	2.67	50.22	12:25
2	TOC	1.5984	15.9842	35.51	38.47	2.96	50.17	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	42	TOC	K1810382-003.06	0.3220 ppm	0.1024 ppm	31.7900%	2018/11/13 18:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3944	3.9437	27.13	30.14	3.00	50.16	12:27
2	TOC	0.2496	2.4962	26.13	28.84	2.71	50.20	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	43	TOC	K1810494-001.06	0.9702 ppm	0.0523 ppm	5.4000%	2018/11/13 18:55

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0072	10.0718	31.40	34.13	2.73	50.26	12:26
2	TOC	0.9331	9.3315	30.88	33.84	2.96	50.24	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	44	TOC	K1810494-002.07	0.9421 ppm	0.0922 ppm	9.7900%	2018/11/13 19:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0073	10.0732	31.40	34.14	2.75	50.23	12:28
2	TOC	0.8769	8.7694	30.49	33.31	2.82	50.23	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	45	TOC	K1810494-002.07 ms	27.8264 ppm	0.0000 ppm	0.0000%	2018/11/13 19:59

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.8264	278.2635	217.97	220.41	2.44	50.19	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

◈	46	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/13 20:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	21.95	24.73	2.78	50.17	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	47	TOC	K1810494-003.06	0.9017 ppm	0.0714 ppm	7.9100%	2018/11/13 20:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9521	9.5212	31.01	33.74	2.73	50.16	12:26
2	TOC	0.8512	8.5121	30.31	33.15	2.84	50.14	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	25.5402 ppm (PASS)	0.0000 ppm	0%	2018/11/13 21:03

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.5402	255.4023	204.34	207.14	2.80	50.13	12:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/13 21:20

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	21.60	24.36	2.76	50.14	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Sample Type: Sample

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	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	48	TOC	K1810494-004.06	1.2571 ppm	0.0995 ppm	7.9200%	2018/11/13 21:36

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.3274	13.2745	33.62	36.33	2.70	50.14	12:25
2	TOC	1.1867	11.8672	32.65	35.42	2.77	50.12	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	49	TOC	K1810494-005.06	0.6595 ppm	0.0582 ppm	8.8300%	2018/11/13 22:08

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.7007	7.0070	29.26	32.17	2.91	50.12	12:28
2	TOC	0.6183	6.1833	28.69	31.57	2.88	50.10	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	50	TOC	K1810494-006.06	0.7486 ppm	0.1352 ppm	18.0600%	2018/11/13 22:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.8442	8.4416	30.26	33.01	2.75	50.13	12:29
2	TOC	0.6530	6.5298	28.93	31.50	2.57	50.20	12:21

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	51	TOC	K1810494-007.06	0.6747 ppm	0.1661 ppm	24.6200%	2018/11/13 23:12

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.7921	7.9213	29.90	32.65	2.75	50.18	12:25
2	TOC	0.5572	5.5724	28.27	31.10	2.84	50.20	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	52	TOC	K1810527-001.01	3.7069 ppm	0.4017 ppm	10.8400%	2018/11/13 23:43

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Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.9910	39.9098	52.15	54.85	2.69	50.17	12:23
2	TOC	3.4229	34.2288	48.20	51.04	2.84	50.19	12:27

Dilution	Blank Contribution	Method	Calibration
: ∩	(C) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended React 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	53	TOC	K1810527-001.01 ms	29.1418 ppm	0.0000 ppm	0.0000%	2018/11/14 00:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	29.1418	291.4180	227.12	229.92	2.80	50.19	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	54	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/14 00:31

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	21.40	24.26	2.86	50.16	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	55	TOC	K1810527-002.03	2.7079 ppm	0.2207 ppm	8.1500%	2018/11/14 00:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.8640	28.6399	44.31	47.12	2.81	50.17	12:26
2	TOC	2.5519	25.5191	42.14	44.96	2.82	50.15	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	56	TOC	RB	1.6482 ppm	2.3309 ppm	141.4200%	2018/11/14 01:19

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.2964	32.9638	47.32	50.35	3.03	50.13	12:26
2	TOC	0.0000	0.0000	23.81	26.77	2.95	50.14	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

		Analysis			Std. Dev.		

	Pos	Type	Sample ID	Result (ppmC)	(ppmC)	RSD	Start Time
◈	57	TOC	K1810527-003.01	2.9837 ppm	0.2937 ppm	9.8400%	2018/11/14 01:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.1913	31.9130	46.59	49.47	2.88	50.14	12:24
[illegible]	[illegible]	[illegible] 760	~~27.7601~~	~~43.70~~	~~46.49~~	~~2.78~~	~~50.12~~	~~12:~~

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	25.1934 ppm (PASS)	0.0000 ppm	0%	2018/11/14 02:23

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.1934	251.9336	201.92	204.71	2.79	50.11	12:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/14 02:39

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	22.44	25.32	2.88	50.11	12:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Sample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	58	TOC	MB4	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/14 02:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	20.20	23.08	2.88	50.12	12:32

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Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> LCS ER — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	21.0351 ppm (PASS)	0.0000 ppm	0%	2018/11/14 03:12

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	21.0351	210.3512	173.00	175.84	2.85	50.14	12:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	21.9 ppmC

Sample Type: Sample — From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	59	TOC	K1810977-001.01	2.9510 ppm	0.2858 ppm	9.6900%	2018/11/14 03:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.8200	28.2000	44.01	46.95	2.94	50.15	12:28
2	TOC	2.7933	27.9326	43.82	46.55	2.73	50.15	12:28
3	TOC	2.8114	28.1137	43.95	46.94	3.00	50.14	12:27
4	TOC	3.3795	33.7947	47.90	50.70	2.80	50.14	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	60	TOC	K1810977-001.01 ms	29.6510 ppm	0.0000 ppm	0.0000%	2018/11/14 04:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	29.6510	296.5096	230.66	233.56	2.90	50.16	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	61	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/14 04:48

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

1	TOC	0.0000	0.0000	22.62	25.45	2.84	50.14	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	62	TOC	K1810977-002.02 4x	1.1496 ppm	0.0642 ppm	5.5900%	2018/11/14 05:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2317	12.3171	32.96	35.80	2.84	50.14	12:24
2	TOC	1.1680	11.6803	32.52	35.31	2.80	50.13	12:25
3	TOC	1.0885	10.8854	31.96	34.85	2.89	50.14	12:26
4	TOC	1.1101	11.1010	32.11	34.86	2.75	50.12	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	63	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/14 06:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	19.35	22.11	2.75	50.13	12:27
2	TOC	0.0000	0.0000	18.67	21.43	2.76	50.14	12:22

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	64	TOC	K1810334-002.02 doc	0.0258 ppm	0.0364 ppm	141.4200%	2018/11/14 06:39

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0515	0.5153	24.75	27.57	2.82	50.13	12:27
2	TOC	0.0000	0.0000	24.23	27.19	2.96	50.12	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	65	TOC	K1810334-002.02 ms doc	26.7505 ppm	0.0000 ppm	0.0000%	2018/11/14 07:11

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.7505	267.5053	210.48	213.33	2.85	50.13	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	66	TOC	K1810334-003.02 doc 4x	1.2613 ppm	0.1787 ppm	14.1700%	2018/11/14 07:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.3877	13.8768	34.04	36.98	2.94	50.12	12:2
2	TOC	1.1350	11.3497	32.29	35.06	2.78	50.11	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.8970 ppm (PASS)	0.0000 ppm	0%	2018/11/14 07:59

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.8970	248.9695	199.86	202.65	2.78	50.11	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/14 08:15

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	20.21	23.01	2.80	50.12	12:33

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Sample Type: Sample From Schedule Version 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	67	TOC	K1810334-004.02 doc	4.7229 ppm	0.0956 ppm	2.0300%	2018/11/14 08:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

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1	TOC	4.7905	47.9052	57.72	60.61	2.90	50.09	12:25
2	TOC	4.6552	46.5525	56.78	59.62	2.85	50.11	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	68	TOC	K1810334-005.04 doc 4x	1.8869 ppm	0.1082 ppm	5.7300%	2018/11/14 09:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.9634	19.6340	38.05	41.00	2.95	50.09	12:28
2	TOC	1.8104	18.1045	36.98	39.86	2.87	50.13	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	69	TOC	K1810334-006.02 doc 2x	2.8114 ppm	0.0109 ppm	0.3900%	2018/11/14 09:35

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.8191	28.1914	44.00	46.78	2.78	50.12	12:23
2	TOC	2.8038	28.0376	43.90	46.65	2.76	50.11	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	70	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/14 10:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	18.66	21.39	2.72	50.17	12:26
2	TOC	0.0000	0.0000	18.44	21.24	2.80	50.16	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	71	TOC	K1810387-002.12 doc	1.3610 ppm	0.0294 ppm	2.1600%	2018/11/14 10:39

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.3818	13.8179	34.00	36.80	2.79	50.17	12:28
2	TOC	1.3402	13.4024	33.71	36.41	2.70	50.15	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC)	Extended Reaction	Extended Reaction

(v1180) 021711 (v3) 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	72	TOC	K1810387-002.12 ms doc	28.2797 ppm	0.0000 ppm	0.0000%	2018/11/14 11:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Ru Time
1	TOC	28.2797	282.7974	221.12	224.06	2.94	50.16	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	73	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/14 11:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	19.56	22.43	2.87	50.19	12:35

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	74	TOC	K1810387-003.12 doc 4x	0.2846 ppm	0.0660 ppm	23.1800%	2018/11/14 11:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3313	3.3127	26.70	29.65	2.96	50.22	12:24
2	TOC	0.2380	2.3797	26.05	28.91	2.86	50.22	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	75	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/11/14 12:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	18.01	20.80	2.79	50.23	12:26
2	TOC	0.0000	0.0000	18.12	20.92	2.80	50.25	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 24.3905 (IC) (v1180)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time

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◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.5715 ppm (PASS)	0.0000 ppm	0%	2018/11/14 12:47

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
-	TOC	25 ppm	1	24.5715	245.7150	197.60	200.29	2.69	50.25	12:2-

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/11/14 13:03

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	0.0 ppm	1	0.0000	0.0000	20.73	23.51	2.78	50.28	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos C
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v19)	0 ppmC

Meta Data Used in this Report

Blanks

Version	Reagent (Abs)	Acid (Abs)	DI IC (Abs)	DI TC (Abs)	DI TOC (Abs)	Save Time	Operator
v1179	2.4107	1.3600	0.0000	0.0000	0.0000	2018/11/08 19:06	Fusion1 (Fusion1)
v1180	1.9643	1.2980	0.0000	0.0000	0.0000	2018/11/12 19:41	Fusion1 (Fusion1)

Calibrations

Name: Extended Reaction 021711 (TOC)

Version:	v19	Calibration curve formula:	TOC: y = 6.957x + 26.664
Ver Creation:	2018/11/02 21:13	r^2 value:	TOC: r^2 = 0.99860
Comment:			
Operator:	Fusion1 (Fusion1)		
Basic Analysis Type	TOC		

Basic Analysis Type: TOC

Sample ID	Y Raw Value	X Expected	Message	End Time
0.0 ppm	30.6200	0.0000		2018/11/02 19:35
0.50 ppm	29.8930	0.5000		2018/11/02 19:52
.0 ppm	31.0960	1.0000		2018/11/02 20:07
5.00 ppm	57.3100	5.0000		2018/11/02 20:23
10.0 ppm	103.4310	10.0000		2018/11/02 20:40
25.0 ppm	194.0320	25.0000		2018/11/02 20:56
50.0 ppm	376.7910	50.0000		2018/11/02 21:12

Methods

Name: Extended Reaction 021711 (TOC)

Version: v3 Operator: Gen Chem Lab (Fusion1)
Ver Creation: 2013/02/04 11:44
Comment:

Parameter	Value
SampleVolume	10.0 mL
Dilution	1:10
AcidVolume	0.5 ml
ReagentVolume	2.0 ml
UVReactorPrerinse	Off
UVReactorPrerinseVolume	5.0
NumberOfUVReactorPrerinses	1
ICSpargeTime	1.00 mins
DetectorSweepFlow	500 ml/min
PreSpargeTime	4.00 mins
SystemFlow	500 ml/min

Advanced Parameter	Value
NeedleRinseVolume	5.0 ml
VialPrimeVolume	2.0 ml
ICSamplePrimeVolume	2.0 ml
ICSpargeRinseVolume	12.0 ml
BaselineStabilizeTime	0.70 min
DetectorPressureFlow	150 ml/min
SyringeSpeedWaste	10
SyringeSpeedAcid	7
SyringeSpeedReagent	7
SyringeSpeedDIWater	7
NDIRPressurization	60 psig
SyringeSpeedSampleDispense	5
SyringeSpeedSampleAspirate	4
SyringeSpeedUVDispense	7
SyringeSpeedUVAspirate	5
SyringeSpeedICDispense	7
SyringeSpeedICAspirate	5
NDIRPressureStabilize	1.75 min
SampleMixing	Off
SampleMixingCycles	1
SampleMixingVolume	10.0
LowLevelFilterNDIR	Off

Acceptance / Approval

Electronic Signatures

Report Version	User Name	Acceptance	Reason	Date

Report History

Report History

Report Version	User Name	System Reason	User Reason	Date
1	Fusion1 (Fusion1)	Schedule completed	Schedule completed	2018/11/14 13:23

StarLIMS Run: 614837, 614838, 614839

Analysis: TOC

Method: SM 5310 C, 9060A

CCV: 11-GEN-05-71A 50 ppm LCS: 11-GEN-05-69N 21.9 ppm

ICAL Date: 11/2/18

ICAL ID: 11-GEN-05-71E

ICS ID: 11-GEN-05-67D

ICS TV: 25.0 ppm ICS % R <1

Spike ID: 11-GEN-05-70O 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-71K

21 % H3PO4: 11-GEN-05-71L

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F, Marge

FILTER ID: NA

Analyzed By: CES	Date Analyzed: 11/16/18
Reviewed By: Thurpel	Date Reviewed: 11/16/18

LABORATORY REPORT

October 31, 2018

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

RE: HS18101278

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on October 25, 2018. For your reference, these analyses have been assigned our service request number P1805803.

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. 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

Kate Kaneko
By Kate Kaneko at 12:54 pm, 10/31/18

Kate Kaneko
Laboratory Director

Client: ALS Laboratory Group Service Request No: P1805803
Project: HS18101278

CASE NARRATIVE

The samples were received intact under chain of custody on October 25, 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.

<u>Carbon Dioxide Analysis</u>

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.

<u>Methane, Ethene and Ethane Analysis</u>

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.

Client: ALS Laboratory Group
Project: HS18101278

Service Request No: P1805803

Manual integrations were performed on the following sample(s) and analyte(s). Refer to the raw data for additional information.

Sample Identification(s)	Analyte(s)
P1805803-001, 002	Methane

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.

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Alaska DEC	http://dec.alaska.gov/eh/lab.aspx	17-019
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/page/la-lab-accreditation	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1347317
New Jersey DEP (NELAP)	http://www.nj.gov/dep/enforcement/oqa.html	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-005
Pennsylvania DEP	http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html	T104704413-18-9
Utah DOH (NELAP)	http://health.utah.gov/lab/lab_cert_env	CA016272018-9
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	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, 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: HS18101278

Service Request: P1805803

Date Received: 10/25/2018
Time Received: 09:30

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	RSK 175 - CO2	RSK 175 - Gases
67WW13-181023	P1805803-001	Water	10/23/2018	09:35	X	X
67WW08-181023	P1805803-002	Water	10/23/2018	10:45	X	X
67WW08-181023-FD	P1805803-003	Water	10/23/2018	10:45	X	X

P1805803

00954752

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Houston, TX 77099
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F: +1 281 530 5887
www.alsglobal.com

Subcontract Chain of Custody

COC ID: 10093

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:	HS18101278
TSR:	Sonia West

	LAB SAMPLE ID / ANALYSIS REQUESTED	CLIENT SAMPLE ID	MATRIX	COLLECT DATE / DUE DATE
1.	**HS18101278-04**	**67WW13-181023**	**Groundwater**	**23 Oct 2018 09:35**
	MEE + CO2. DOD IV. Equis EDD			01 Nov 2018
2.	**HS18101278-05**	**67WW08-181023**	**Groundwater**	**23 Oct 2018 10:45**
	MEE + CO2. DOD IV. Equis EDD			01 Nov 2018
3.	**HS18101278-06**	**67WW08-181023-FD**	**Groundwater**	**23 Oct 2018 10:45**
	MEE + CO2. DOD IV. Equis EDD			01 Nov 2018

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

QC Level: DOD IV (DoD Data Package)

Relinquished By:	Pablo Mireles	Date/Time:	10-24-18
Received By:		Date/Time:	10/25/18 0930
Cooler ID(s):		Temperature(s):	2°

ALS Environmental
Sample Acceptance Check Form

Client: ALS Laboratory Group Work order: P1805803
Project: HS18101278
Sample(s) received on: 10/25/18 Date opened: 10/25/18 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.

#	Question	Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature: 2° C Blank Temperature: ° C Thermometer ID CO907034581 Wet Ic			
8	Were **custody seals** on outside of cooler/Box/Container?	☒	☐	☐
	Location of seal(s)? Cooler lid. Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☒	☐
	Were **<u>VOA vials</u>** checked for presence/absence of air bubbles?	☒	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	☐	☒	☐
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1805803-001.01	40mL VOA NP		7		A	MR 10/29/18
P1805803-001.02	40mL VOA NP				A	
P1805803-001.03	40mL VOA NP				A	
P1805803-002.01	40mL VOA NP		7		A	MR 10/29/18
P1805803-002.02	40mL VOA NP				A	
P1805803-002.03	40mL VOA NP				A	
P1805803-003.01	40mL VOA NP		7		A	MR 10/29/18
P1805803-003.02	40mL VOA NP				A	
P1805803-003.03	40mL VOA NP				A	

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

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS Environmental
Sample Acceptance Check Form

Client: ALS Laboratory Group Work order: P1805803
Project: HS18101278
Sample(s) received on: 10/25/18 Date opened: 10/25/18 by: ADAVID

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments

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

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Project ID: **HS18101278**
ALS Project ID: P1805803

Carbon Dioxide

Test Code: RSK 175
Instrument ID: HP5890A/GC10/TCD
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date(s) Collected: 10/23/18
Date Received: 10/25/18
Date Analyzed: 10/29/18

Client Sample ID	ALS Sample ID	Injection Volume ml(s)	**Result µg/L**	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
67WW13-181023	P1805803-001	0.050	**620,000**	2,000	1,700	740	
67WW08-181023	P1805803-002	0.050	**130,000**	2,000	1,700	740	
67WW08-181023-FD	P1805803-003	0.050	**130,000**	2,000	1,700	740	
Method Control Sample	P181029-MB	0.10	860	1,000	860	370	**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

Client: **ALS Laboratory Group**
Client Sample ID: **Duplicate Lab Control Sample**
Client Project ID: **HS18101278**

ALS Project ID: P1805803
ALS Sample ID: P181029-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: 10/29/18
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount LCS / DLCS ug/L	Result[1] LCS ug/L	DLCS ug/L	**% Recovery LCS**	**DLCS**	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
124-38-9	Carbon Dioxide	22,900	20,200	19,400	**88**	**85**	80-122	3	15	

[1] = 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

Client: **ALS Laboratory Group**
Client Sample ID: **67WW13-181023**
Client Project ID: **HS18101278**

ALS Project ID: P1805803
ALS Sample ID: P1805803-001

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 10/23/18
Date Received: 10/25/18
Date Analyzed: 10/29/18
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	**0.85**	1.3	1.0	0.51	**J, B**
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.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
B = Analyte detected in both the sample and associated method blank.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **67WW08-181023**
Client Project ID: **HS18101278**

ALS Project ID: P1805803
ALS Sample ID: P1805803-002

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 10/23/18
Date Received: 10/25/18
Date Analyzed: 10/29/18
Volume(s) Analyzed: 0.050 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**5.4**	2.6	2.0	1.0	**B**
74-85-1	Ethene	1.1	2.0	1.1	0.48	**U**
74-84-0	Ethane	0.94	1.2	0.94	0.32	**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.
B = Analyte detected in both the sample and associated method blank.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **67WW08-181023-FD**
Client Project ID: **HS18101278**

ALS Project ID: P1805803
ALS Sample ID: P1805803-003

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 10/23/18
Date Received: 10/25/18
Date Analyzed: 10/29/18
Volume(s) Analyzed: 0.050 ml(s)

CAS #	**Compound**	**Result µg/L**	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**5.5**	2.6	2.0	1.0	**B**
74-85-1	Ethene	1.1	2.0	1.1	0.48	**U**
74-84-0	Ethane	0.94	1.2	0.94	0.32	**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.
B = Analyte detected in both the sample and associated method blank.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **Method Control Sample**
Client Project ID: **HS18101278**

ALS Project ID: P1805803
ALS Sample ID: P181029-MB

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 10/29/18
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	**0.58**	1.3	1.0	0.51	**J**
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.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

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: **HS18101278**

ALS Project ID: P1805803
ALS Sample ID: P181029-LCS
P181029-DLCS

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 10/29/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Spike Amount LCS / DLCS µg/L	Result[1] LCS µg/L	Result[1] DLCS µg/L	% Recovery LCS	% Recovery DLCS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
74-82-8	Methane	2.50	2.02	2.24	**81**	**90**	73-125	11	12	
74-85-1	Ethene	4.37	4.37	4.41	**100**	**101**	72-133	1	7	
74-84-0	Ethane	4.69	4.61	4.59	**98**	**98**	74-131	0	6	

[1] = 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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November 02, 2018

Kim Napier
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18101528**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Kim,

ALS Environmental received 7 sample(s) on Oct 26, 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 Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18101528

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18101528-01	67WW05-181025	Groundwater		25-Oct-2018 09:30	26-Oct-2018 08:45	☐
HS18101528-02	67WW05-181025-FD	Groundwater		25-Oct-2018 09:30	26-Oct-2018 08:45	☐
HS18101528-03	67WW02-181025	Groundwater		25-Oct-2018 10:25	26-Oct-2018 08:45	☐
HS18101528-04	67WW07-181025	Groundwater		25-Oct-2018 11:25	26-Oct-2018 08:45	☐
HS18101528-05	67WW09A-181025	Groundwater		25-Oct-2018 12:25	26-Oct-2018 08:45	☐
HS18101528-06	67WW16I-181025	Groundwater		25-Oct-2018 13:20	26-Oct-2018 08:45	☐
HS18101528-07	Trip Blank	Water	ALS-101218-25	25-Oct-2018 00:00	26-Oct-2018 08:45	☐

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.	**CASE NARRATIVE**
Project:	Longhorn Army Ammunition Plant	
Work Order:	HS18101528	

GCMS Volatiles by Method SW8260

Batch ID: R326668

Sample ID: 67WW09A-181025 (HS18101528-05MS)

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW05-181025		Lab ID:HS18101528-01
Collection Date:	25-Oct-2018 09:30		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 16:44
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 16:44
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 16:44
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	01-Nov-2018 16:44
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	01-Nov-2018 16:44
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	01-Nov-2018 16:44
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW05-181025		Lab ID:HS18101528-01
Collection Date:	25-Oct-2018 09:30		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 16:44
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 16:44
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 16:44
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:44
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:44
Surr: 1,2-Dichloroethane-d4	*94.6*			**0**	*70-126*	*%REC*	*1*	*01-Nov-2018 16:44*
Surr: 4-Bromofluorobenzene	*98.5*			**0**	*81-113*	*%REC*	*1*	*01-Nov-2018 16:44*
Surr: Dibromofluoromethane	*96.9*			**0**	*77-123*	*%REC*	*1*	*01-Nov-2018 16:44*
Surr: Toluene-d8	*91.5*			**0**	*82-127*	*%REC*	*1*	*01-Nov-2018 16:44*

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

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 67WW05-181025-FD
Collection Date: 25-Oct-2018 09:30

ANALYTICAL REPORT
WorkOrder:HS18101528
Lab ID:HS18101528-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 17:08
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 17:08
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 17:08
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	01-Nov-2018 17:08
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	01-Nov-2018 17:08
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	01-Nov-2018 17:08
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW05-181025-FD		Lab ID:HS18101528-02
Collection Date:	25-Oct-2018 09:30		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 17:08
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 17:08
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 17:08
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:08
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:08
Surr: 1,2-Dichloroethane-d4	*95.1*			**0**	*70-126*	*%REC*	*1*	*01-Nov-2018 17:08*
Surr: 4-Bromofluorobenzene	*99.2*			**0**	*81-113*	*%REC*	*1*	*01-Nov-2018 17:08*
Surr: Dibromofluoromethane	*96.7*			**0**	*77-123*	*%REC*	*1*	*01-Nov-2018 17:08*
Surr: Toluene-d8	*94.2*			**0**	*82-127*	*%REC*	*1*	*01-Nov-2018 17:08*

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW02-181025		Lab ID:HS18101528-03
Collection Date:	25-Oct-2018 10:25		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,1-Dichloroethene	**6.9**		**0.20**	**0.50**	**1.0**	**ug/L**	1	01-Nov-2018 17:32
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 17:32
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 17:32
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 17:32
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	01-Nov-2018 17:32
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	01-Nov-2018 17:32
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	01-Nov-2018 17:32
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW02-181025		Lab ID:HS18101528-03
Collection Date:	25-Oct-2018 10:25		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 17:32
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 17:32
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 17:32
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:32
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:32
Surr: 1,2-Dichloroethane-d4	*95.7*			**0**	*70-126*	*%REC*	*1*	*01-Nov-2018 17:32*
Surr: 4-Bromofluorobenzene	*99.0*			**0**	*81-113*	*%REC*	*1*	*01-Nov-2018 17:32*
Surr: Dibromofluoromethane	*97.2*			**0**	*77-123*	*%REC*	*1*	*01-Nov-2018 17:32*
Surr: Toluene-d8	*93.6*			**0**	*82-127*	*%REC*	*1*	*01-Nov-2018 17:32*

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW07-181025		Lab ID:HS18101528-04
Collection Date:	25-Oct-2018 11:25		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 17:57
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 17:57
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 17:57
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	01-Nov-2018 17:57
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	01-Nov-2018 17:57
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	01-Nov-2018 17:57
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW07-181025		Lab ID:HS18101528-04
Collection Date:	25-Oct-2018 11:25		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 17:57
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 17:57
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 17:57
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 17:57
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 17:57
Surr: 1,2-Dichloroethane-d4	*96.2*			**0**	*70-126*	*%REC*	*1*	*01-Nov-2018 17:57*
Surr: 4-Bromofluorobenzene	*98.1*			**0**	*81-113*	*%REC*	*1*	*01-Nov-2018 17:57*
Surr: Dibromofluoromethane	*98.8*			**0**	*77-123*	*%REC*	*1*	*01-Nov-2018 17:57*
Surr: Toluene-d8	*93.7*			**0**	*82-127*	*%REC*	*1*	*01-Nov-2018 17:57*

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:	HS18101528
Sample ID:	67WW09A-181025	Lab ID:	HS18101528-05
Collection Date:	25-Oct-2018 12:25	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 18:21
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 18:21
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 18:21
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	01-Nov-2018 18:21
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	01-Nov-2018 18:21
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	01-Nov-2018 18:21
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW09A-181025		Lab ID:HS18101528-05
Collection Date:	25-Oct-2018 12:25		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 18:21
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 18:21
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 18:21
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:21
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:21
Surr: 1,2-Dichloroethane-d4	*96.7*			**0**	*70-126*	*%REC*	*1*	*01-Nov-2018 18:21*
Surr: 4-Bromofluorobenzene	*99.1*			**0**	*81-113*	*%REC*	*1*	*01-Nov-2018 18:21*
Surr: Dibromofluoromethane	*99.5*			**0**	*77-123*	*%REC*	*1*	*01-Nov-2018 18:21*
Surr: Toluene-d8	*94.0*			**0**	*82-127*	*%REC*	*1*	*01-Nov-2018 18:21*

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

ALS Houston, US

Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW16I-181025		Lab ID:HS18101528-06
Collection Date:	25-Oct-2018 13:20		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 18:46
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 18:46
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 18:46
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	01-Nov-2018 18:46
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	01-Nov-2018 18:46
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	01-Nov-2018 18:46
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46

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

ALS Houston, US

Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	67WW16I-181025		Lab ID:HS18101528-06
Collection Date:	25-Oct-2018 13:20		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 18:46
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 18:46
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 18:46
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 18:46
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 18:46
Surr: 1,2-Dichloroethane-d4	*91.9*			**0**	*70-126*	*%REC*	*1*	*01-Nov-2018 18:46*
Surr: 4-Bromofluorobenzene	*99.9*			**0**	*81-113*	*%REC*	*1*	*01-Nov-2018 18:46*
Surr: Dibromofluoromethane	*95.1*			**0**	*77-123*	*%REC*	*1*	*01-Nov-2018 18:46*
Surr: Toluene-d8	*94.3*			**0**	*82-127*	*%REC*	*1*	*01-Nov-2018 18:46*

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	Trip Blank		Lab ID:HS18101528-07
Collection Date:	25-Oct-2018 00:00		Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2-Dibromo-3-chloropropane	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 16:19
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 16:19
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 16:19
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	01-Nov-2018 16:19
Acetone	2.0	U	2.0	2.0	2.0	ug/L	1	01-Nov-2018 16:19
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	01-Nov-2018 16:19
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19

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

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant		WorkOrder:HS18101528
Sample ID:	Trip Blank		Lab ID:HS18101528-07
Collection Date:	25-Oct-2018 00:00		Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	ug/L	1	01-Nov-2018 16:19
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	01-Nov-2018 16:19
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	01-Nov-2018 16:19
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	01-Nov-2018 16:19
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	01-Nov-2018 16:19
Surr: 1,2-Dichloroethane-d4	*95.5*			**0**	*70-126*	*%REC*	*1*	*01-Nov-2018 16:19*
Surr: 4-Bromofluorobenzene	*98.4*			**0**	*81-113*	*%REC*	*1*	*01-Nov-2018 16:19*
Surr: Dibromofluoromethane	*96.8*			**0**	*77-123*	*%REC*	*1*	*01-Nov-2018 16:19*
Surr: Toluene-d8	*93.6*			**0**	*82-127*	*%REC*	*1*	*01-Nov-2018 16:19*

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

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R326668	**Test Name :** LOW LEVEL VOLATILES BY SW8260C			**Matrix:** Water		
HS18101528-07	Trip Blank	25 Oct 2018 00:00			01 Nov 2018 16:19	1
Batch ID R326668	**Test Name :** LOW LEVEL VOLATILES BY SW8260C			**Matrix:** Groundwater		
HS18101528-01	67WW05-181025	25 Oct 2018 09:30			01 Nov 2018 16:44	1
HS18101528-02	67WW05-181025-FD	25 Oct 2018 09:30			01 Nov 2018 17:08	1
HS18101528-03	67WW02-181025	25 Oct 2018 10:25			01 Nov 2018 17:32	1
HS18101528-04	67WW07-181025	25 Oct 2018 11:25			01 Nov 2018 17:57	1
HS18101528-05	67WW09A-181025	25 Oct 2018 12:25			01 Nov 2018 18:21	1
HS18101528-06	67WW16I-181025	25 Oct 2018 13:20			01 Nov 2018 18:46	1

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: **R326668** **Instrument:** **VOA2** **Method:** **SW8260**

MBLK Sample ID: **VBLKW-181101** Units: **ug/L** Analysis Date: **01-Nov-2018 11:38**
Client ID: Run ID: **VOA2_326668** SeqNo: **4801123** 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-Trichlor-1,2,2-trifluoroethane	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	1.0	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	2.0	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

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: R326668 **Instrument:** VOA2 **Method:** SW8260

MBLK Sample ID: **VBLKW-181101** Units: **ug/L** Analysis Date: **01-Nov-2018 11:38**
Client ID: Run ID: **VOA2_326668** SeqNo: **4801123** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	0.50	1.0								U
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	1.0	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	*47.1*	*1.0*	*50*	*0*	*94.2*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*48.98*	*1.0*	*50*	*0*	*98.0*	*82 - 115*				
Surr: Dibromofluoromethane	*48.5*	*1.0*	*50*	*0*	*97.0*	*73 - 126*				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: **R326668** **Instrument:** **VOA2** **Method:** **SW8260**

MBLK Sample ID: **VBLKW-181101** Units: **ug/L** Analysis Date: **01-Nov-2018 11:38**
Client ID: Run ID: **VOA2_326668** SeqNo: **4801123** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.73*	*1.0*	*50*	*0*	*93.5*	*81 - 120*				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: R326668 **Instrument:** VOA2 **Method:** SW8260

LCS Sample ID: **VLCSW-181101** Units: **ug/L** Analysis Date: **01-Nov-2018 10:49**
Client ID: Run ID: **VOA2_326668** SeqNo: **4801121** 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	19.77	1.0	20	0	98.9	77 - 118				
1,1,1-Trichloroethane	18.99	1.0	20	0	94.9	70 - 130				
1,1,2,2-Tetrachloroethane	18.08	1.0	20	0	90.4	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	21.58	1.0	20	0	108	70 - 130				
1,1,2-Trichloroethane	20.2	1.0	20	0	101	77 - 113				
1,1-Dichloroethane	19.84	1.0	20	0	99.2	71 - 122				
1,1-Dichloroethene	19.18	1.0	20	0	95.9	70 - 130				
1,1-Dichloropropene	21.4	1.0	20	0	107	78 - 118				
1,2,3-Trichlorobenzene	16.82	1.0	20	0	84.1	70 - 130				
1,2,3-Trichloropropane	18.23	1.0	20	0	91.1	70 - 127				
1,2,4-Trichlorobenzene	17.72	1.0	20	0	88.6	77 - 126				
1,2,4-Trimethylbenzene	20.25	1.0	20	0	101	73 - 121				
1,2-Dibromo-3-chloropropane	16.4	1.0	20	0	82.0	70 - 130				
1,2-Dibromoethane	20.35	1.0	20	0	102	76 - 123				
1,2-Dichlorobenzene	18.99	1.0	20	0	94.9	77 - 113				
1,2-Dichloroethane	20.64	1.0	20	0	103	70 - 124				
1,2-Dichloropropane	21.31	1.0	20	0	107	72 - 119				
1,3,5-Trimethylbenzene	18.62	1.0	20	0	93.1	75 - 118				
1,3-Dichlorobenzene	19.34	1.0	20	0	96.7	78 - 118				
1,3-Dichloropropane	20.43	1.0	20	0	102	75 - 116				
1,4-Dichlorobenzene	19.57	1.0	20	0	97.9	79 - 113				
2,2-Dichloropropane	22.82	1.0	20	0	114	70 - 130				
2-Butanone	40.22	2.0	40	0	101	70 - 130				
2-Chlorotoluene	20.67	1.0	20	0	103	70 - 128				
2-Hexanone	40.4	2.0	40	0	101	70 - 130				
4-Chlorotoluene	21.15	1.0	20	0	106	74 - 126				
4-Isopropyltoluene	17.6	1.0	20	0	88.0	74 - 126				
4-Methyl-2-pentanone	41.52	2.0	40	0	104	70 - 130				
Acetone	39.53	2.0	40	0	98.8	70 - 130				
Benzene	19.77	1.0	20	0	98.8	74 - 120				
Bromobenzene	18.97	1.0	20	0	94.9	78 - 113				
Bromochloromethane	19.83	1.0	20	0	99.1	76 - 124				
Bromodichloromethane	20.75	1.0	20	0	104	74 - 122				
Bromoform	19.54	1.0	20	0	97.7	73 - 128				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: R326668 **Instrument:** VOA2 **Method:** SW8260

LCS Sample ID: **VLCSW-181101** Units: **ug/L** Analysis Date: **01-Nov-2018 10:49**
Client ID: Run ID: **VOA2_326668** SeqNo: **4801121** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	23.97	1.0	20	0	120	70 - 130				
Carbon disulfide	38.55	2.0	40	0	96.4	70 - 130				
Carbon tetrachloride	20.76	1.0	20	0	104	71 - 125				
Chlorobenzene	20.04	1.0	20	0	100	76 - 113				
Chloroethane	20.6	1.0	20	0	103	70 - 130				
Chloroform	19.41	1.0	20	0	97.1	71 - 121				
Chloromethane	20.06	1.0	20	0	100	70 - 129				
cis-1,2-Dichloroethene	19.98	1.0	20	0	99.9	75 - 122				
cis-1,3-Dichloropropene	22.45	1.0	20	0	112	73 - 127				
Dibromochloromethane	20.05	1.0	20	0	100	77 - 122				
Dibromomethane	20.91	1.0	20	0	105	78 - 121				
Dichlorodifluoromethane	19.55	1.0	20	0	97.8	70 - 130				
Ethylbenzene	21.28	1.0	20	0	106	77 - 117				
Hexachlorobutadiene	19.22	1.0	20	0	96.1	70 - 130				
Isopropylbenzene	19.23	1.0	20	0	96.1	73 - 127				
m,p-Xylene	43.49	2.0	40	0	109	77 - 122				
Methylene chloride	19.43	2.0	20	0	97.2	70 - 127				
Naphthalene	15.26	1.0	20	0	76.3	70 - 130				
n-Butylbenzene	20.06	1.0	20	0	100	72 - 130				
n-Propylbenzene	21.07	1.0	20	0	105	73 - 124				
o-Xylene	21.22	1.0	20	0	106	75 - 119				
sec-Butylbenzene	18.35	1.0	20	0	91.7	73 - 128				
Styrene	20.07	1.0	20	0	100	72 - 126				
tert-Butylbenzene	20.17	1.0	20	0	101	73 - 124				
Tetrachloroethene	19.56	1.0	20	0	97.8	76 - 119				
Toluene	19.55	1.0	20	0	97.7	77 - 118				
trans-1,2-Dichloroethene	19.78	1.0	20	0	98.9	72 - 127				
trans-1,3-Dichloropropene	22.57	1.0	20	0	113	77 - 119				
Trichloroethene	19.51	1.0	20	0	97.6	77 - 121				
Trichlorofluoromethane	21.18	1.0	20	0	106	70 - 130				
Vinyl chloride	21.13	1.0	20	0	106	70 - 130				
Surr: 1,2-Dichloroethane-d4	*49.69*	*1.0*	*50*	*0*	*99.4*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.88*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*48.38*	*1.0*	*50*	*0*	*96.8*	*73 - 126*				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: **R326668** **Instrument:** **VOA2** **Method:** **SW8260**

LCS Sample ID: **VLCSW-181101** Units: **ug/L** Analysis Date: **01-Nov-2018 10:49**
Client ID: Run ID: **VOA2_326668** SeqNo: **4801121** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.32*	*1.0*	*50*	*0*	*90.6*	*81 - 120*				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: **R326668** **Instrument:** **VOA2** **Method:** **SW8260**

MS Sample ID: **HS18101528-05MS** Units: **ug/L** Analysis Date: **01-Nov-2018 19:59**
Client ID: **67WW09A-181025** Run ID: **VOA2_326668** SeqNo: **4801138** 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	18.03	1.0	20	0	90.2	70 - 120				
1,1,1-Trichloroethane	18.22	1.0	20	0	91.1	70 - 130				
1,1,2,2-Tetrachloroethane	14.6	1.0	20	0	73.0	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.36	1.0	20	0	112	70 - 130				
1,1,2-Trichloroethane	16.98	1.0	20	0	84.9	70 - 117				
1,1-Dichloroethane	18.87	1.0	20	0	94.4	70 - 127				
1,1-Dichloroethene	18.51	1.0	20	0	92.6	70 - 130				
1,1-Dichloropropene	20.47	1.0	20	0	102	70 - 129				
1,2,3-Trichlorobenzene	13.68	1.0	20	0	68.4	70 - 130				S
1,2,3-Trichloropropane	14.43	1.0	20	0	72.1	70 - 130				
1,2,4-Trichlorobenzene	15.03	1.0	20	0	75.1	70 - 125				
1,2,4-Trimethylbenzene	17.72	1.0	20	0	88.6	70 - 125				
1,2-Dibromo-3-chloropropane	13.37	1.0	20	0	66.8	70 - 130				S
1,2-Dibromoethane	17.62	1.0	20	0	88.1	70 - 124				
1,2-Dichlorobenzene	16.57	1.0	20	0	82.8	70 - 115				
1,2-Dichloroethane	18.76	1.0	20	0	93.8	70 - 127				
1,2-Dichloropropane	18.84	1.0	20	0	94.2	70 - 122				
1,3,5-Trimethylbenzene	16.37	1.0	20	0	81.8	70 - 126				
1,3-Dichlorobenzene	16.81	1.0	20	0	84.0	70 - 119				
1,3-Dichloropropane	17.43	1.0	20	0	87.2	70 - 121				
1,4-Dichlorobenzene	16.86	1.0	20	0	84.3	70 - 114				
2,2-Dichloropropane	20.2	1.0	20	0	101	70 - 130				
2-Butanone	31.23	2.0	40	0	78.1	70 - 130				
2-Chlorotoluene	18.33	1.0	20	0	91.6	70 - 130				
2-Hexanone	30.33	2.0	40	0	75.8	70 - 130				
4-Chlorotoluene	18.38	1.0	20	0	91.9	70 - 130				
4-Isopropyltoluene	15.75	1.0	20	0	78.7	70 - 130				
4-Methyl-2-pentanone	31.6	2.0	40	0	79.0	70 - 130				
Acetone	30.44	2.0	40	0	76.1	70 - 130				
Benzene	18.45	1.0	20	0	92.2	70 - 127				
Bromobenzene	16.68	1.0	20	0	83.4	70 - 115				
Bromochloromethane	18.1	1.0	20	0	90.5	70 - 127				
Bromodichloromethane	18.56	1.0	20	0	92.8	70 - 124				
Bromoform	15.83	1.0	20	0	79.1	70 - 129				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: R326668 **Instrument:** VOA2 **Method:** SW8260

MS Sample ID: **HS18101528-05MS** Units: **ug/L** Analysis Date: **01-Nov-2018 19:59**
Client ID: **67WW09A-181025** Run ID: **VOA2_326668** SeqNo: **4801138** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	22.59	1.0	20	0	113	70 - 130				
Carbon disulfide	36.82	2.0	40	0	92.0	70 - 130				
Carbon tetrachloride	19.69	1.0	20	0	98.4	70 - 130				
Chlorobenzene	18.36	1.0	20	0	91.8	70 - 114				
Chloroethane	19.75	1.0	20	0	98.7	70 - 130				
Chloroform	18.04	1.0	20	0	90.2	70 - 125				
Chloromethane	17.8	1.0	20	0	89.0	70 - 130				
cis-1,2-Dichloroethene	18.22	1.0	20	0	91.1	70 - 128				
cis-1,3-Dichloropropene	18.87	1.0	20	0	94.3	70 - 125				
Dibromochloromethane	17.2	1.0	20	0	86.0	70 - 124				
Dibromomethane	17.69	1.0	20	0	88.4	70 - 124				
Dichlorodifluoromethane	19.14	1.0	20	0	95.7	70 - 130				
Ethylbenzene	19.73	1.0	20	0	98.7	70 - 124				
Hexachlorobutadiene	17.09	1.0	20	0	85.5	70 - 130				
Isopropylbenzene	18.16	1.0	20	0	90.8	70 - 130				
m,p-Xylene	39.23	2.0	40	0	98.1	70 - 130				
Methylene chloride	18.09	2.0	20	0	90.4	70 - 128				
Naphthalene	11.47	1.0	20	0	57.4	70 - 130				S
n-Butylbenzene	18.09	1.0	20	0	90.4	70 - 130				
n-Propylbenzene	18.87	1.0	20	0	94.4	70 - 130				
o-Xylene	18.65	1.0	20	0	93.3	70 - 124				
sec-Butylbenzene	16.82	1.0	20	0	84.1	70 - 130				
Styrene	17.42	1.0	20	0	87.1	70 - 130				
tert-Butylbenzene	18.78	1.0	20	0	93.9	70 - 130				
Tetrachloroethene	18.51	1.0	20	0	92.5	70 - 130				
Toluene	17.95	1.0	20	0	89.8	70 - 123				
trans-1,2-Dichloroethene	19.51	1.0	20	0	97.5	70 - 130				
trans-1,3-Dichloropropene	18.84	1.0	20	0	94.2	70 - 121				
Trichloroethene	18.45	1.0	20	0	92.3	70 - 129				
Trichlorofluoromethane	20.46	1.0	20	0	102	70 - 130				
Vinyl chloride	20.94	1.0	20	0	105	70 - 130				
Surr: 1,2-Dichloroethane-d4	*49.72*	*1.0*	*50*	*0*	*99.4*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*50.93*	*1.0*	*50*	*0*	*102*	*81 - 113*				
Surr: Dibromofluoromethane	*48.82*	*1.0*	*50*	*0*	*97.6*	*77 - 123*				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: **R326668** **Instrument:** **VOA2** **Method:** **SW8260**

MS Sample ID: **HS18101528-05MS** Units: **ug/L** Analysis Date: **01-Nov-2018 19:59**

Client ID: **67WW09A-181025** Run ID: **VOA2_326668** SeqNo: **4801138** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.33*	*1.0*	*50*	*0*	*90.7*	*82 - 127*				

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: R326668 **Instrument:** VOA2 **Method:** SW8260

MSD Sample ID: **HS18101528-05MSD** Units: **ug/L** Analysis Date: **01-Nov-2018 20:23**
Client ID: **67WW09A-181025** Run ID: **VOA2_326668** SeqNo: **4801139** 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	17.99	1.0	20	0	89.9	70 - 120	18.03	0.262	20	
1,1,1-Trichloroethane	17.57	1.0	20	0	87.8	70 - 130	18.22	3.64	20	
1,1,2,2-Tetrachloroethane	15.64	1.0	20	0	78.2	70 - 123	14.6	6.88	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	20.42	1.0	20	0	102	70 - 130	22.36	9.07	20	
1,1,2-Trichloroethane	17.71	1.0	20	0	88.6	70 - 117	16.98	4.21	20	
1,1-Dichloroethane	18.45	1.0	20	0	92.2	70 - 127	18.87	2.28	20	
1,1-Dichloroethene	17.86	1.0	20	0	89.3	70 - 130	18.51	3.62	20	
1,1-Dichloropropene	19.4	1.0	20	0	97.0	70 - 129	20.47	5.38	20	
1,2,3-Trichlorobenzene	14.78	1.0	20	0	73.9	70 - 130	13.68	7.78	20	
1,2,3-Trichloropropane	15.53	1.0	20	0	77.7	70 - 130	14.43	7.37	20	
1,2,4-Trichlorobenzene	15.8	1.0	20	0	79.0	70 - 125	15.03	5	20	
1,2,4-Trimethylbenzene	17.92	1.0	20	0	89.6	70 - 125	17.72	1.08	20	
1,2-Dibromo-3-chloropropane	14.95	1.0	20	0	74.7	70 - 130	13.37	11.1	20	
1,2-Dibromoethane	17.61	1.0	20	0	88.1	70 - 124	17.62	0.0605	20	
1,2-Dichlorobenzene	17.22	1.0	20	0	86.1	70 - 115	16.57	3.85	20	
1,2-Dichloroethane	18.54	1.0	20	0	92.7	70 - 127	18.76	1.16	20	
1,2-Dichloropropane	18.85	1.0	20	0	94.3	70 - 122	18.84	0.0698	20	
1,3,5-Trimethylbenzene	16.45	1.0	20	0	82.3	70 - 126	16.37	0.507	20	
1,3-Dichlorobenzene	17.24	1.0	20	0	86.2	70 - 119	16.81	2.53	20	
1,3-Dichloropropane	17.96	1.0	20	0	89.8	70 - 121	17.43	2.98	20	
1,4-Dichlorobenzene	17.45	1.0	20	0	87.2	70 - 114	16.86	3.42	20	
2,2-Dichloropropane	19.35	1.0	20	0	96.8	70 - 130	20.2	4.29	20	
2-Butanone	33.2	2.0	40	0	83.0	70 - 130	31.23	6.12	20	
2-Chlorotoluene	18.57	1.0	20	0	92.8	70 - 130	18.33	1.28	20	
2-Hexanone	33.67	2.0	40	0	84.2	70 - 130	30.33	10.4	20	
4-Chlorotoluene	18.8	1.0	20	0	94.0	70 - 130	18.38	2.28	20	
4-Isopropyltoluene	15.54	1.0	20	0	77.7	70 - 130	15.75	1.33	20	
4-Methyl-2-pentanone	34.99	2.0	40	0	87.5	70 - 130	31.6	10.2	20	
Acetone	33.38	2.0	40	0	83.4	70 - 130	30.44	9.19	20	
Benzene	18.21	1.0	20	0	91.1	70 - 127	18.45	1.3	20	
Bromobenzene	17.18	1.0	20	0	85.9	70 - 115	16.68	2.94	20	
Bromochloromethane	18.17	1.0	20	0	90.9	70 - 127	18.1	0.392	20	
Bromodichloromethane	18.56	1.0	20	0	92.8	70 - 124	18.56	0.0378	20	
Bromoform	17.17	1.0	20	0	85.9	70 - 129	15.83	8.14	20	

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: R326668 **Instrument:** VOA2 **Method:** SW8260

MSD Sample ID: **HS18101528-05MSD** Units: **ug/L** Analysis Date: **01-Nov-2018 20:23**
Client ID: **67WW09A-181025** Run ID: **VOA2_326668** SeqNo: **4801139** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.15	1.0	20	0	101	70 - 130	22.59	11.4	20	
Carbon disulfide	35.5	2.0	40	0	88.7	70 - 130	36.82	3.65	20	
Carbon tetrachloride	19.24	1.0	20	0	96.2	70 - 130	19.69	2.32	20	
Chlorobenzene	18.04	1.0	20	0	90.2	70 - 114	18.36	1.76	20	
Chloroethane	18.33	1.0	20	0	91.7	70 - 130	19.75	7.43	20	
Chloroform	17.42	1.0	20	0	87.1	70 - 125	18.04	3.48	20	
Chloromethane	16.61	1.0	20	0	83.1	70 - 130	17.8	6.93	20	
cis-1,2-Dichloroethene	18.05	1.0	20	0	90.3	70 - 128	18.22	0.905	20	
cis-1,3-Dichloropropene	19.54	1.0	20	0	97.7	70 - 125	18.87	3.5	20	
Dibromochloromethane	17.66	1.0	20	0	88.3	70 - 124	17.2	2.66	20	
Dibromomethane	18.55	1.0	20	0	92.8	70 - 124	17.69	4.79	20	
Dichlorodifluoromethane	17.68	1.0	20	0	88.4	70 - 130	19.14	7.92	20	
Ethylbenzene	19.46	1.0	20	0	97.3	70 - 124	19.73	1.4	20	
Hexachlorobutadiene	17.05	1.0	20	0	85.2	70 - 130	17.09	0.244	20	
Isopropylbenzene	17.81	1.0	20	0	89.1	70 - 130	18.16	1.96	20	
m,p-Xylene	38.92	2.0	40	0	97.3	70 - 130	39.23	0.792	20	
Methylene chloride	17.26	2.0	20	0	86.3	70 - 128	18.09	4.68	20	
Naphthalene	13.08	1.0	20	0	65.4	70 - 130	11.47	13.1	20	S
n-Butylbenzene	18.05	1.0	20	0	90.2	70 - 130	18.09	0.238	20	
n-Propylbenzene	18.92	1.0	20	0	94.6	70 - 130	18.87	0.228	20	
o-Xylene	18.86	1.0	20	0	94.3	70 - 124	18.65	1.1	20	
sec-Butylbenzene	16.42	1.0	20	0	82.1	70 - 130	16.82	2.46	20	
Styrene	17.65	1.0	20	0	88.2	70 - 130	17.42	1.29	20	
tert-Butylbenzene	18.22	1.0	20	0	91.1	70 - 130	18.78	3.05	20	
Tetrachloroethene	17.78	1.0	20	0	88.9	70 - 130	18.51	4.03	20	
Toluene	17.85	1.0	20	0	89.3	70 - 123	17.95	0.557	20	
trans-1,2-Dichloroethene	18.79	1.0	20	0	94.0	70 - 130	19.51	3.72	20	
trans-1,3-Dichloropropene	19.47	1.0	20	0	97.4	70 - 121	18.84	3.27	20	
Trichloroethene	17.73	1.0	20	0	88.6	70 - 129	18.45	3.99	20	
Trichlorofluoromethane	19.95	1.0	20	0	99.7	70 - 130	20.46	2.51	20	
Vinyl chloride	19	1.0	20	0	95.0	70 - 130	20.94	9.74	20	
Surr: 1,2-Dichloroethane-d4	*49.69*	*1.0*	*50*	*0*	*99.4*	*70 - 126*	*49.72*	*0.0698*	*20*	
Surr: 4-Bromofluorobenzene	*51.14*	*1.0*	*50*	*0*	*102*	*81 - 113*	*50.93*	*0.398*	*20*	
Surr: Dibromofluoromethane	*48.29*	*1.0*	*50*	*0*	*96.6*	*77 - 123*	*48.82*	*1.08*	*20*	

ALS Houston, US Date: 02-Nov-18

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18101528

QC BATCH REPORT

Batch ID: R326668 **Instrument:** VOA2 **Method:** SW8260

MSD Sample ID: **HS18101528-05MSD** Units: **ug/L** Analysis Date: **01-Nov-2018 20:23**
Client ID: **67WW09A-181025** Run ID: **VOA2_326668** SeqNo: **4801139** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.62*	*1.0*	*50*	*0*	*91.2*	*82 - 127*	*45.33*	*0.633*	*20*	

The following samples were analyzed in this batch:

HS18101528-01	HS18101528-02	HS18101528-03	HS18101528-04
HS18101528-05	HS18101528-06	HS18101528-07	

ALS Houston, US Date: 02-Nov-18

Client:	Aptim Environmental & Infrastucture, Inc.	**QUALIFIERS, ACRONYMS, UNITS**
Project:	Longhorn Army Ammunition Plant	
WorkOrder:	**HS18101528**	

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
North Carolina	624-2018	31-Dec-2018
Arkansas	88-0356	27-Mar-2019
Texas	T10470231-18-21	30-Apr-2019
North Dakota	R193 2018-2019	30-Apr-2019
Illinois	004438	29-Jun-2019
Louisiana	03087	30-Jun-2019
Dept of Defense	ANAB L2231	22-Dec-2018
Kentucky	123043 - 2018	30-Apr-2019
Kansas	E-10352 2018-2019	31-Jul-2019
Oklahoma	2018-156	31-Aug-2019

ALS Houston, US Date: 02-Nov-18

Sample Receipt Checklist

Client Name:	CBI-Houston	Date/Time Received:	**26-Oct-2018 08:45**
Work Order:	HS18101528	Received by:	**PJM**

Checklist completed by: *Paresh M. Giga* (eSignature) 26-Oct-2018 (Date)

Reviewed by: *RJ Modashia* (eSignature) 29-Oct-2018 (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):	1.3c/0.9c U/C		IR11
Cooler(s)/Kit(s):	43656		
Date/Time sample(s) sent to storage:	10/26/18 18:30		
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:

APTIM

COC ID: 67-OCT2018-GW-ALSHT-1810 TURNAROUND TIME: normal RUSH:

PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name	Longhorn AAP	Lab Name	ALS Laboratories	Email Invoice To	FedInvoices@CBIFederalServices.com
Project Number	501032	Lab Contact	RJ Modashia		
	LHAAP-67	Email	RJ.Modashia@alsglobal.com	Email Report To	Kim.napier@aptim.com
Address	1203-B East Grand Avenue	Address	10450 Stancliff Rd., Suite 210	Mail Reports To	Kim Napier
	PMB 202			Address	2410 Cherahala Blvd.
City	Marshall; State TX	City	Houston; State TX	City	Knoxville; State TN
Postal Code	75670; Country USA	Postal Code	77099; Country USA	Postal Code	37932; Country USA
Phone Number	713.243.7264	Phone Number	281.575.2279 or 281.530.5656		
Project Manager	Praveen Srivastav			Shipping Company	

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Carbon Dioxide in Water by RSK175	Methane, Ethane, Ethene in Water by RSK175	Anions in Water by E300.0	TOC in Water by E415.1	TIC in Water by E415.1	Sulfide in Water by E376.1	Alkalinity by E310.1		
67WW05-181025	LHAAP 67	25.80	26.07		WG	10/25/18	0930	3		X									
67WW05-181025-FD	LHAAP 67	25.80	26.07		WG	10/25/18	0930	3		X									
67WW02-181025	LHAAP 67	24.35	24.60		WG	10/25/18	1025	3		X									
67WW07-181025	LHAA 67	24.94	25.19		WG	10/25/18	1125	3		X									
67WW09A-181025	LHAAP 67	27.02	27.26		WG	10/25/18	1225	3		X									
67WW09A-181025-MS	LHAAP 67	27.02	27.26		WG	10/25/18	1225	3		X									
67WW09A-181025-MSD	LHAAP67	27.02	27.26		WG	10/25/18	1225	3		X									
67WW16I-181025	LHAA67	24.03	24.22		WG	10/25/18	1320	3		X									
TRIP BLANK					W	10/25/18		2		X									

HS18101528
Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Anions should include chloride, nitrate, nitrite, and sulfate.	[signature] / BHATE	10/25/18 1430	PM 10/26/18 0345	
			Cooler 43656 Temp 1-3c IR11 CF-0-4c	

00954796

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

43656

CUSTODY SEAL

Date: 10/25/18 Time: 1430
Name: Scott Beesinger
Company: BAHATx

Seal Broken By: SJM
Date: 10/26/18

43656 OCT 2 6 2018

Must Deliver Next Business Day
Time and Tempature Sensitive!

43656

ORIGIN ID:SGRA (903) 930-6193
SCOTT BEESINGER
APTIM ENVIROMENTAL & INFASTRUCTURE
1203-B EAST GRAND AVE
PMB 202
MARSHALL, TX 75670
UNITED STATES US

SHIP DATE: 17OCT18
ACTWGT: 1.00 LB MAN
CAD: 300130/CAFE3211
DIMS: 26x14x14 IN

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP 67-RJ

RMA:

FedEx Express
E

FedEx
TRK# 0221 4380 9533 6780

FRI - 26 OCT 10:30A
PRIORITY OVERNIGHT

AB SGRA

77099
TX-US
IAH

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

May 17, 2019

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS19050082**

Laboratory Results for: **Longhorn Army Ammunition Plant LHAAP-67**

Dear Susan,

ALS Environmental received 7 sample(s) on May 02, 2019 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: JUMOKE.LAWAL
RJ Modashia
Project Manager

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
Work Order: HS19050082

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS19050082-01	67WW13-190501	Groundwater		01-May-2019 08:00	02-May-2019 08:51	☐
HS19050082-02	67WW13-190501 FD	Groundwater		01-May-2019 08:00	02-May-2019 08:51	☐
HS19050082-03	67WW08-190501	Groundwater		01-May-2019 09:00	02-May-2019 08:51	☐
HS19050082-04	67WW11-190501	Groundwater		01-May-2019 09:55	02-May-2019 08:51	☐
HS19050082-05	67WW16I-190501	Groundwater		01-May-2019 10:45	02-May-2019 08:51	☐
HS19050082-06	67WW02-190501	Groundwater		01-May-2019 11:35	02-May-2019 08:51	☐
HS19050082-07	Trip Blank	Water	C&G 040119-201	01-May-2019 00:00	02-May-2019 08:51	☐

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
Work Order:

CASE NARRATIVE

Work Order Comments

- The analysis for Methane, Methene, Ethane and CO2 by RSK175 was subcontracted to ALS Simi Valley, CA. Final report attached.

- The analysis for TOC was subcontracted to ALS Kelso, WA. Final report attached.

GCMS Volatiles by Method SW8260

Batch ID: R338352

Sample ID: VLCSW-190513

- 1,2,3_Trichlorobenezene exceeded QC limits for LCS. CCV is OK. Samples are ND for this compound.

Sample ID: 67WW11-190501 (HS19050082-04MS)

- MS/MSD failed QC limits for some few cmpounds

WetChemistry by Method SW9056

Batch ID: R337814

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050082
Sample ID:	67WW13-190501	Lab ID:	HS19050082-01
Collection Date:	01-May-2019 08:00	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 19:21
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 19:21
1,1,2-Trichloroethane	**3.9**		**0.30**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 19:21
1,1-Dichloroethane	**14**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 19:21
1,1-Dichloroethene	**200**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 19:21
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 19:21
1,2-Dichloroethane	**24**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 19:21
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 19:21
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 19:21
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	13-May-2019 19:21
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	13-May-2019 19:21
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 19:21
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	13-May-2019 19:21
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 19:21
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**	
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050082
Sample ID:	67WW13-190501	Lab ID:	HS19050082-01
Collection Date:	01-May-2019 08:00	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
cis-1,2-Dichloroethene	**0.94**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 19:21
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	13-May-2019 19:21
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	13-May-2019 19:21
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 19:21
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 19:21
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 19:21
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
Trichloroethene	**1.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 19:21
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 19:21
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 19:21
Surr: 1,2-Dichloroethane-d4	*86.8*			**0**	*81-118*	*%REC*	*1*	*13-May-2019 19:21*
Surr: 4-Bromofluorobenzene	*98.3*			**0**	*85-114*	*%REC*	*1*	*13-May-2019 19:21*
Surr: Dibromofluoromethane	*88.2*			**0**	*80-119*	*%REC*	*1*	*13-May-2019 19:21*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*1*	*13-May-2019 19:21*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: AJH
Chloride	**1,240**		**10.0**	**25.0**	**25.0**	**mg/L**	50	03-May-2019 04:45
Nitrogen, Nitrate (As N)	**0.697**		**0.150**	**0.500**	**0.500**	**mg/L**	5	03-May-2019 04:31
Sulfate	**284**		**10.0**	**25.0**	**25.0**	**mg/L**	50	03-May-2019 04:45
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	17-May-2019 15:08
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	14-May-2019 12:57

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050082
Sample ID:	67WW13-190501 FD		Lab ID:HS19050082-02
Collection Date:	01-May-2019 08:00		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:09
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:09
1,1,2-Trichloroethane	**3.8**		**0.30**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:09
1,1-Dichloroethane	**13**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:09
1,1-Dichloroethene	**160**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:09
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:09
1,2-Dichloroethane	**23**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:09
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:09
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 20:09
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	13-May-2019 20:09
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	13-May-2019 20:09
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 20:09
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	13-May-2019 20:09
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:09
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050082
Sample ID:	67WW13-190501 FD		Lab ID:HS19050082-02
Collection Date:	01-May-2019 08:00		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
cis-1,2-Dichloroethene	**0.81**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:09
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	13-May-2019 20:09
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	13-May-2019 20:09
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 20:09
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 20:09
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:09
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
Trichloroethene	**1.00**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:09
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:09
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:09
Surr: 1,2-Dichloroethane-d4	*86.5*			**0**	*81-118*	*%REC*	*1*	*13-May-2019 20:09*
Surr: 4-Bromofluorobenzene	*100*			**0**	*85-114*	*%REC*	*1*	*13-May-2019 20:09*
Surr: Dibromofluoromethane	*89.7*			**0**	*80-119*	*%REC*	*1*	*13-May-2019 20:09*
Surr: Toluene-d8	*104*			**0**	*89-112*	*%REC*	*1*	*13-May-2019 20:09*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: AJH
Chloride	**1,300**		**10.0**	**25.0**	**25.0**	**mg/L**	50	03-May-2019 05:14
Nitrogen, Nitrate (As N)	**0.657**		**0.150**	**0.500**	**0.500**	**mg/L**	5	03-May-2019 05:00
Sulfate	**318**		**1.00**	**2.50**	**2.50**	**mg/L**	5	03-May-2019 05:00
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	17-May-2019 15:08
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	14-May-2019 12:57

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050082
Sample ID:	67WW08-190501	Lab ID:	HS19050082-03
Collection Date:	01-May-2019 09:00	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:57
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:57
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
1,1-Dichloroethane	**7.5**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:57
1,1-Dichloroethene	**110**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:57
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:57
1,2-Dichloroethane	**5.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 20:57
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:57
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 20:57
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	13-May-2019 20:57
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	13-May-2019 20:57
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 20:57
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	13-May-2019 20:57
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 20:57
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050082
Sample ID:	67WW08-190501	Lab ID:	HS19050082-03
Collection Date:	01-May-2019 09:00	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	13-May-2019 20:57
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	13-May-2019 20:57
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 20:57
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 20:57
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 20:57
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 20:57
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 20:57
Surr: 1,2-Dichloroethane-d4	*87.0*			**0**	*81-118*	*%REC*	*1*	*13-May-2019 20:57*
Surr: 4-Bromofluorobenzene	*98.3*			**0**	*85-114*	*%REC*	*1*	*13-May-2019 20:57*
Surr: Dibromofluoromethane	*88.7*			**0**	*80-119*	*%REC*	*1*	*13-May-2019 20:57*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*13-May-2019 20:57*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: AJH
Chloride	**1,680**		**10.0**	**25.0**	**25.0**	**mg/L**	50	03-May-2019 06:13
Nitrogen, Nitrate (As N)	0.500	U	0.150	0.500	0.500	mg/L	5	03-May-2019 05:29
Sulfate	**479**		**1.00**	**2.50**	**2.50**	**mg/L**	5	03-May-2019 05:29
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	17-May-2019 15:08
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	14-May-2019 12:57

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050082
Sample ID:	67WW11-190501		Lab ID:HS19050082-04
Collection Date:	01-May-2019 09:55		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:32
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:32
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
1,1-Dichloroethane	**1.9**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 18:32
1,1-Dichloroethene	**2.8**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 18:32
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:32
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 18:32
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	13-May-2019 18:32
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	13-May-2019 18:32
Acetone	**5.6**		**0.40**	**1.0**	**2.0**	**UG/L**	1	13-May-2019 18:32
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	13-May-2019 18:32
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:32
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:HS19050082
Sample ID:	67WW11-190501	Lab ID:HS19050082-04
Collection Date:	01-May-2019 09:55	Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	13-May-2019 18:32
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	13-May-2019 18:32
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 18:32
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 18:32
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:32
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:32
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:32
Surr: 1,2-Dichloroethane-d4	*87.0*			**0**	*81-118*	*%REC*	*1*	*13-May-2019 18:32*
Surr: 4-Bromofluorobenzene	*98.5*			**0**	*85-114*	*%REC*	*1*	*13-May-2019 18:32*
Surr: Dibromofluoromethane	*88.6*			**0**	*80-119*	*%REC*	*1*	*13-May-2019 18:32*
Surr: Toluene-d8	*104*			**0**	*89-112*	*%REC*	*1*	*13-May-2019 18:32*

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050082
Sample ID:	67WW16I-190501	Lab ID:	HS19050082-05
Collection Date:	01-May-2019 10:45	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:57
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:57
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:57
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 18:57
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	13-May-2019 18:57
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	13-May-2019 18:57
Acetone	**3.3**		**0.40**	**1.0**	**2.0**	**UG/L**	1	13-May-2019 18:57
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
Carbon disulfide	**0.90**	J	**0.60**	**1.0**	**2.0**	**UG/L**	1	13-May-2019 18:57
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:57
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050082
Sample ID:	67WW16I-190501		Lab ID:HS19050082-05
Collection Date:	01-May-2019 10:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	13-May-2019 18:57
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	13-May-2019 18:57
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 18:57
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 18:57
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:57
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:57
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:57
Surr: 1,2-Dichloroethane-d4	*86.2*			**0**	*81-118*	*%REC*	*1*	*13-May-2019 18:57*
Surr: 4-Bromofluorobenzene	*97.7*			**0**	*85-114*	*%REC*	*1*	*13-May-2019 18:57*
Surr: Dibromofluoromethane	*89.8*			**0**	*80-119*	*%REC*	*1*	*13-May-2019 18:57*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*1*	*13-May-2019 18:57*

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050082
Sample ID:	67WW02-190501		Lab ID:HS19050082-06
Collection Date:	01-May-2019 11:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 21:21
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 21:21
1,1,2-Trichloroethane	**1.2**		**0.30**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 21:21
1,1-Dichloroethane	**8.4**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 21:21
1,1-Dichloroethene	**180**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 21:21
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 21:21
1,2-Dichloroethane	**4.7**		**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 21:21
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 21:21
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 21:21
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	13-May-2019 21:21
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	13-May-2019 21:21
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 21:21
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	13-May-2019 21:21
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 21:21
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21

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

ALS Houston, US

Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050082
Sample ID:	67WW02-190501		Lab ID:HS19050082-06
Collection Date:	01-May-2019 11:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	13-May-2019 21:21
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	13-May-2019 21:21
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 21:21
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 21:21
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 21:21
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
Trichloroethene	**0.87**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	13-May-2019 21:21
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 21:21
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 21:21
Surr: 1,2-Dichloroethane-d4	*86.4*			**0**	*81-118*	*%REC*	*1*	*13-May-2019 21:21*
Surr: 4-Bromofluorobenzene	*97.6*			**0**	*85-114*	*%REC*	*1*	*13-May-2019 21:21*
Surr: Dibromofluoromethane	*87.9*			**0**	*80-119*	*%REC*	*1*	*13-May-2019 21:21*
Surr: Toluene-d8	*106*			**0**	*89-112*	*%REC*	*1*	*13-May-2019 21:21*

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

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050082
Sample ID:	Trip Blank		Lab ID:HS19050082-07
Collection Date:	01-May-2019 00:00		Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:08
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:08
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:08
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 18:08
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	13-May-2019 18:08
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	13-May-2019 18:08
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 18:08
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	13-May-2019 18:08
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	13-May-2019 18:08
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08

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

ALS Houston, US

Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050082
Sample ID:	Trip Blank	Lab ID:	HS19050082-07
Collection Date:	01-May-2019 00:00	Matrix:	Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	13-May-2019 18:08
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	13-May-2019 18:08
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	13-May-2019 18:08
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	13-May-2019 18:08
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	13-May-2019 18:08
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	13-May-2019 18:08
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	13-May-2019 18:08
Surr: 1,2-Dichloroethane-d4	*86.3*			**0**	*81-118*	*%REC*	*1*	*13-May-2019 18:08*
Surr: 4-Bromofluorobenzene	*98.3*			**0**	*85-114*	*%REC*	*1*	*13-May-2019 18:08*
Surr: Dibromofluoromethane	*88.4*			**0**	*80-119*	*%REC*	*1*	*13-May-2019 18:08*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*1*	*13-May-2019 18:08*

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

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R337814	**Test Name :** ANIONS BY SW9056A			**Matrix:** Groundwater		
HS19050082-01	67WW13-190501	01 May 2019 08:00			03 May 2019 04:45	50
HS19050082-01	67WW13-190501	01 May 2019 08:00			03 May 2019 04:31	5
HS19050082-02	67WW13-190501 FD	01 May 2019 08:00			03 May 2019 05:14	50
HS19050082-02	67WW13-190501 FD	01 May 2019 08:00			03 May 2019 05:00	5
HS19050082-03	67WW08-190501	01 May 2019 09:00			03 May 2019 06:13	50
HS19050082-03	67WW08-190501	01 May 2019 09:00			03 May 2019 05:29	5
Batch ID R338352	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C			**Matrix:** Water		
HS19050082-07	Trip Blank	01 May 2019 00:00			13 May 2019 18:08	1
Batch ID R338352	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C			**Matrix:** Groundwater		
HS19050082-01	67WW13-190501	01 May 2019 08:00			13 May 2019 19:21	1
HS19050082-02	67WW13-190501 FD	01 May 2019 08:00			13 May 2019 20:09	1
HS19050082-03	67WW08-190501	01 May 2019 09:00			13 May 2019 20:57	1
HS19050082-04	67WW11-190501	01 May 2019 09:55			13 May 2019 18:32	1
HS19050082-05	67WW16I-190501	01 May 2019 10:45			13 May 2019 18:57	1
HS19050082-06	67WW02-190501	01 May 2019 11:35			13 May 2019 21:21	1
Batch ID R338362	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS			**Matrix:** Groundwater		
HS19050082-01	67WW13-190501	01 May 2019 08:00			14 May 2019 12:57	1
HS19050082-02	67WW13-190501 FD	01 May 2019 08:00			14 May 2019 12:57	1
HS19050082-03	67WW08-190501	01 May 2019 09:00			14 May 2019 12:57	1
Batch ID R338663	**Test Name :** SUBCONTRACT ANALYSIS - RSK			**Matrix:** Groundwater		
HS19050082-01	67WW13-190501	01 May 2019 08:00			17 May 2019 15:08	1
HS19050082-02	67WW13-190501 FD	01 May 2019 08:00			17 May 2019 15:08	1
HS19050082-03	67WW08-190501	01 May 2019 09:00			17 May 2019 15:08	1

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190513** Units: **UG/L** Analysis Date: **13-May-2019 17:44**
Client ID: Run ID: **VOA6_338352** SeqNo: **5073708** 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-Trichlor-1,2,2-trifluoroethane	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

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190513** Units: **UG/L** Analysis Date: **13-May-2019 17:44**
Client ID: Run ID: **VOA6_338352** SeqNo: **5073708** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	0.50	1.0								U
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	1.0	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	*44.3*	*1.0*	*50*	*0*	*88.6*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*49.08*	*1.0*	*50*	*0*	*98.2*	*85 - 114*				
Surr: Dibromofluoromethane	*45.08*	*1.0*	*50*	*0*	*90.2*	*80 - 119*				

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190513** Units: **UG/L** Analysis Date: **13-May-2019 17:44**
Client ID: Run ID: **VOA6_338352** SeqNo: **5073708** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*52.81*	*1.0*	*50*	*0*	*106*	*89 - 112*				

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

LCS Sample ID: **VLCSW-190513** Units: **UG/L** Analysis Date: **13-May-2019 16:56**
Client ID: Run ID: **VOA6_338352** SeqNo: **5073707** 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	19.32	1.0	20	0	96.6	78 - 124				
1,1,1-Trichloroethane	19.74	1.0	20	0	98.7	74 - 131				
1,1,2,2-Tetrachloroethane	19.96	1.0	20	0	99.8	71 - 121				
1,1,2-Trichlor-1,2,2-trifluoroethane	20.59	1.0	20	0	103	70 - 136				
1,1,2-Trichloroethane	19.96	1.0	20	0	99.8	80 - 119				
1,1-Dichloroethane	19.16	1.0	20	0	95.8	77 - 125				
1,1-Dichloroethene	19.01	1.0	20	0	95.0	71 - 131				
1,1-Dichloropropene	18.91	1.0	20	0	94.6	78 - 125				
1,2,3-Trichlorobenzene	26.33	1.0	20	0	132	69 - 129				S
1,2,3-Trichloropropane	20.19	1.0	20	0	101	73 - 122				
1,2,4-Trichlorobenzene	22.75	1.0	20	0	114	69 - 130				
1,2,4-Trimethylbenzene	19.99	1.0	20	0	100.0	76 - 124				
1,2-Dibromo-3-chloropropane	21.98	1.0	20	0	110	62 - 128				
1,2-Dibromoethane	19.95	1.0	20	0	99.7	77 - 121				
1,2-Dichlorobenzene	20.17	1.0	20	0	101	80 - 119				
1,2-Dichloroethane	19.03	1.0	20	0	95.1	73 - 128				
1,2-Dichloropropane	19.29	1.0	20	0	96.5	78 - 122				
1,3,5-Trimethylbenzene	20.09	1.0	20	0	100	75 - 124				
1,3-Dichlorobenzene	20.05	1.0	20	0	100	80 - 119				
1,3-Dichloropropane	19.64	1.0	20	0	98.2	80 - 119				
1,4-Dichlorobenzene	19.97	1.0	20	0	99.8	79 - 118				
2,2-Dichloropropane	19.91	1.0	20	0	99.6	60 - 139				
2-Butanone	44.93	2.0	40	0	112	56 - 143				
2-Chlorotoluene	19.35	1.0	20	0	96.8	79 - 122				
2-Hexanone	41.25	2.0	40	0	103	57 - 139				
4-Chlorotoluene	19.51	1.0	20	0	97.6	78 - 122				
4-Isopropyltoluene	20.04	1.0	20	0	100	77 - 127				
4-Methyl-2-pentanone	39.31	2.0	40	0	98.3	67 - 130				
Acetone	49.56	2.0	40	0	124	39 - 160				
Benzene	19.56	1.0	20	0	97.8	79 - 120				
Bromobenzene	19.88	1.0	20	0	99.4	80 - 120				
Bromochloromethane	21.04	1.0	20	0	105	78 - 123				
Bromodichloromethane	19.76	1.0	20	0	98.8	79 - 125				
Bromoform	20.81	1.0	20	0	104	66 - 130				

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

LCS Sample ID: **VLCSW-190513** Units: **UG/L** Analysis Date: **13-May-2019 16:56**
Client ID: Run ID: **VOA6_338352** SeqNo: **5073707** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	23.51	1.0	20	0	118	53 - 141				
Carbon disulfide	39.35	2.0	40	0	98.4	64 - 133				
Carbon tetrachloride	18.37	1.0	20	0	91.8	72 - 136				
Chlorobenzene	19.71	1.0	20	0	98.5	82 - 118				
Chloroethane	18.84	1.0	20	0	94.2	60 - 138				
Chloroform	19.88	1.0	20	0	99.4	79 - 124				
Chloromethane	17.84	1.0	20	0	89.2	50 - 139				
cis-1,2-Dichloroethene	20.11	1.0	20	0	101	78 - 123				
cis-1,3-Dichloropropene	20.11	1.0	20	0	101	75 - 124				
Dibromochloromethane	19.59	1.0	20	0	98.0	74 - 126				
Dibromomethane	19.94	1.0	20	0	99.7	79 - 123				
Dichlorodifluoromethane	19.48	1.0	20	0	97.4	32 - 152				
Ethylbenzene	19.89	1.0	20	0	99.4	79 - 121				
Hexachlorobutadiene	23.13	1.0	20	0	116	66 - 134				
Isopropylbenzene	19.77	1.0	20	0	98.8	72 - 131				
m,p-Xylene	39.48	2.0	40	0	98.7	80 - 121				
Methylene chloride	20.07	2.0	20	0	100	74 - 124				
Naphthalene	23.84	1.0	20	0	119	61 - 128				
n-Butylbenzene	20.9	1.0	20	0	104	75 - 128				
n-Propylbenzene	19.84	1.0	20	0	99.2	76 - 126				
o-Xylene	20.01	1.0	20	0	100	78 - 122				
sec-Butylbenzene	20	1.0	20	0	100	77 - 126				
Styrene	19.91	1.0	20	0	99.6	78 - 123				
tert-Butylbenzene	20.1	1.0	20	0	101	78 - 124				
Tetrachloroethene	19.89	1.0	20	0	99.4	74 - 129				
Toluene	19.66	1.0	20	0	98.3	80 - 121				
trans-1,2-Dichloroethene	20.14	1.0	20	0	101	75 - 124				
trans-1,3-Dichloropropene	20.59	1.0	20	0	103	73 - 127				
Trichloroethene	19.3	1.0	20	0	96.5	79 - 123				
Trichlorofluoromethane	18.83	1.0	20	0	94.2	65 - 141				
Vinyl chloride	18.45	1.0	20	0	92.3	58 - 137				
Surr: 1,2-Dichloroethane-d4	*51.97*	*1.0*	*50*	*0*	*104*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*52.24*	*1.0*	*50*	*0*	*104*	*85 - 114*				
Surr: Dibromofluoromethane	*52.15*	*1.0*	*50*	*0*	*104*	*80 - 119*				

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**QC BATCH REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
WorkOrder:	HS19050082	

Batch ID: **R338352 (0)** **Instrument:** **VOA6** **Method:** **VOLATILES ORGANICS BY METHOD 8260C**

LCS Sample ID: **VLCSW-190513** Units: **UG/L** Analysis Date: **13-May-2019 16:56**

Client ID: Run ID: **VOA6_338352** SeqNo: **5073707** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*50.73*	*1.0*	*50*	*0*	*101*	*89 - 112*				

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19050082-04MS** Units: **UG/L** Analysis Date: **13-May-2019 21:45**
Client ID: **67WW11-190501** Run ID: **VOA6_338352** SeqNo: **5073721** 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	18.38	1.0	20	0	91.9	78 - 124				
1,1,1-Trichloroethane	17	1.0	20	0	85.0	74 - 131				
1,1,2,2-Tetrachloroethane	18.91	1.0	20	0	94.6	71 - 121				
1,1,2-Trichlor-1,2,2-trifluoroethane	18.11	1.0	20	0	90.6	70 - 136				
1,1,2-Trichloroethane	18.74	1.0	20	0	93.7	80 - 119				
1,1-Dichloroethane	18.38	1.0	20	1.906	82.4	77 - 125				
1,1-Dichloroethene	20.24	1.0	20	2.829	87.0	71 - 131				
1,1-Dichloropropene	18.11	1.0	20	0	90.5	78 - 125				
1,2,3-Trichlorobenzene	19.32	1.0	20	0	96.6	69 - 129				
1,2,3-Trichloropropane	18.22	1.0	20	0	91.1	73 - 122				
1,2,4-Trichlorobenzene	18.36	1.0	20	0	91.8	69 - 130				
1,2,4-Trimethylbenzene	18.5	1.0	20	0	92.5	76 - 124				
1,2-Dibromo-3-chloropropane	20.34	1.0	20	0	102	62 - 128				
1,2-Dibromoethane	18.59	1.0	20	0	93.0	77 - 121				
1,2-Dichlorobenzene	19.14	1.0	20	0	95.7	80 - 119				
1,2-Dichloroethane	17.02	1.0	20	0	85.1	73 - 128				
1,2-Dichloropropane	17.77	1.0	20	0	88.9	78 - 122				
1,3,5-Trimethylbenzene	19.24	1.0	20	0	96.2	75 - 124				
1,3-Dichlorobenzene	18.99	1.0	20	0	95.0	80 - 119				
1,3-Dichloropropane	18.8	1.0	20	0	94.0	80 - 119				
1,4-Dichlorobenzene	18.49	1.0	20	0	92.4	79 - 118				
2,2-Dichloropropane	15.87	1.0	20	0	79.3	60 - 139				
2-Butanone	34.89	2.0	40	0	87.2	56 - 143				
2-Chlorotoluene	19.12	1.0	20	0	95.6	79 - 122				
2-Hexanone	35.13	2.0	40	0	87.8	57 - 139				
4-Chlorotoluene	18.74	1.0	20	0	93.7	78 - 122				
4-Isopropyltoluene	19.69	1.0	20	0	98.5	77 - 127				
4-Methyl-2-pentanone	37.77	2.0	40	0	94.4	67 - 130				
Acetone	33.27	2.0	40	5.643	69.1	39 - 160				
Benzene	17.26	1.0	20	0	86.3	79 - 120				
Bromobenzene	18.15	1.0	20	0	90.7	80 - 120				
Bromochloromethane	16.25	1.0	20	0	81.2	78 - 123				
Bromodichloromethane	17.06	1.0	20	0	85.3	79 - 125				
Bromoform	18.99	1.0	20	0	94.9	66 - 130				

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19050082-04MS** Units: **UG/L** Analysis Date: **13-May-2019 21:45**
Client ID: **67WW11-190501** Run ID: **VOA6_338352** SeqNo: **5073721** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	15.21	1.0	20	0	76.1	53 - 141				
Carbon disulfide	34.68	2.0	40	0	86.7	64 - 133				
Carbon tetrachloride	17.09	1.0	20	0	85.4	72 - 136				
Chlorobenzene	19.08	1.0	20	0	95.4	82 - 118				
Chloroethane	16.8	1.0	20	0	84.0	60 - 138				
Chloroform	16.27	1.0	20	0	81.4	79 - 124				
Chloromethane	15.34	1.0	20	0	76.7	50 - 139				
cis-1,2-Dichloroethene	15.99	1.0	20	0	79.9	78 - 123				
cis-1,3-Dichloropropene	18.14	1.0	20	0	90.7	75 - 124				
Dibromochloromethane	18.69	1.0	20	0	93.4	74 - 126				
Dibromomethane	17.09	1.0	20	0	85.5	79 - 123				
Dichlorodifluoromethane	14.6	1.0	20	0	73.0	32 - 152				
Ethylbenzene	18.84	1.0	20	0	94.2	79 - 121				
Hexachlorobutadiene	19.78	1.0	20	0	98.9	66 - 134				
Isopropylbenzene	19.04	1.0	20	0	95.2	72 - 131				
m,p-Xylene	38.56	2.0	40	0	96.4	80 - 121				
Methylene chloride	16.93	2.0	20	0	84.7	74 - 124				
Naphthalene	18	1.0	20	0	90.0	61 - 128				
n-Butylbenzene	19.52	1.0	20	0	97.6	75 - 128				
n-Propylbenzene	19.91	1.0	20	0	99.5	76 - 126				
o-Xylene	19.35	1.0	20	0	96.7	78 - 122				
sec-Butylbenzene	20.19	1.0	20	0	101	77 - 126				
Styrene	18.44	1.0	20	0	92.2	78 - 123				
tert-Butylbenzene	20.21	1.0	20	0	101	78 - 124				
Tetrachloroethene	19.61	1.0	20	0	98.1	74 - 129				
Toluene	18.68	1.0	20	0	93.4	80 - 121				
trans-1,2-Dichloroethene	17.21	1.0	20	0	86.1	75 - 124				
trans-1,3-Dichloropropene	17.11	1.0	20	0	85.6	73 - 127				
Trichloroethene	18.04	1.0	20	0	90.2	79 - 123				
Trichlorofluoromethane	16.69	1.0	20	0	83.4	65 - 141				
Vinyl chloride	17.21	1.0	20	0	86.1	58 - 137				
Surr: 1,2-Dichloroethane-d4	*44.43*	*1.0*	*50*	*0*	*88.9*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*49.85*	*1.0*	*50*	*0*	*99.7*	*85 - 114*				
Surr: Dibromofluoromethane	*45.28*	*1.0*	*50*	*0*	*90.6*	*80 - 119*				

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**QC BATCH REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
WorkOrder:	HS19050082	

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19050082-04MS** Units: **UG/L** Analysis Date: **13-May-2019 21:45**

Client ID: **67WW11-190501** Run ID: **VOA6_338352** SeqNo: **5073721** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*52.44*	*1.0*	*50*	*0*	*105*	*89 - 112*				

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MSD Sample ID: **HS19050082-04MSD** Units: **UG/L** Analysis Date: **13-May-2019 22:09**
Client ID: **67WW11-190501** Run ID: **VOA6_338352** SeqNo: **5073722** 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	17.3	1.0	20	0	86.5	78 - 124	18.38	6.05	20	
1,1,1-Trichloroethane	15.97	1.0	20	0	79.9	74 - 131	17	6.21	20	
1,1,2,2-Tetrachloroethane	19.33	1.0	20	0	96.7	71 - 121	18.91	2.2	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	17.02	1.0	20	0	85.1	70 - 136	18.11	6.23	20	
1,1,2-Trichloroethane	17.66	1.0	20	0	88.3	80 - 119	18.74	5.89	20	
1,1-Dichloroethane	17.07	1.0	20	1.906	75.8	77 - 125	18.38	7.41	20	S
1,1-Dichloroethene	18.49	1.0	20	2.829	78.3	71 - 131	20.24	9.04	20	
1,1-Dichloropropene	16.94	1.0	20	0	84.7	78 - 125	18.11	6.67	20	
1,2,3-Trichlorobenzene	20.38	1.0	20	0	102	69 - 129	19.32	5.34	20	
1,2,3-Trichloropropane	18.49	1.0	20	0	92.5	73 - 122	18.22	1.45	20	
1,2,4-Trichlorobenzene	18.57	1.0	20	0	92.9	69 - 130	18.36	1.15	20	
1,2,4-Trimethylbenzene	18.05	1.0	20	0	90.2	76 - 124	18.5	2.46	20	
1,2-Dibromo-3-chloropropane	20.33	1.0	20	0	102	62 - 128	20.34	0.0561	20	
1,2-Dibromoethane	17.79	1.0	20	0	89.0	77 - 121	18.59	4.4	20	
1,2-Dichlorobenzene	18.76	1.0	20	0	93.8	80 - 119	19.14	2	20	
1,2-Dichloroethane	16.27	1.0	20	0	81.3	73 - 128	17.02	4.54	20	
1,2-Dichloropropane	16.69	1.0	20	0	83.5	78 - 122	17.77	6.29	20	
1,3,5-Trimethylbenzene	19.05	1.0	20	0	95.3	75 - 124	19.24	0.967	20	
1,3-Dichlorobenzene	18.61	1.0	20	0	93.1	80 - 119	18.99	2	20	
1,3-Dichloropropane	18.03	1.0	20	0	90.1	80 - 119	18.8	4.22	20	
1,4-Dichlorobenzene	18.54	1.0	20	0	92.7	79 - 118	18.49	0.299	20	
2,2-Dichloropropane	14.41	1.0	20	0	72.0	60 - 139	15.87	9.67	20	
2-Butanone	33.51	2.0	40	0	83.8	56 - 143	34.89	4.06	20	
2-Chlorotoluene	18.65	1.0	20	0	93.2	79 - 122	19.12	2.49	20	
2-Hexanone	34.74	2.0	40	0	86.9	57 - 139	35.13	1.09	20	
4-Chlorotoluene	18.58	1.0	20	0	92.9	78 - 122	18.74	0.857	20	
4-Isopropyltoluene	19.33	1.0	20	0	96.7	77 - 127	19.69	1.83	20	
4-Methyl-2-pentanone	35.81	2.0	40	0	89.5	67 - 130	37.77	5.31	20	
Acetone	31.29	2.0	40	5.643	64.1	39 - 160	33.27	6.15	20	
Benzene	16.35	1.0	20	0	81.7	79 - 120	17.26	5.42	20	
Bromobenzene	18.08	1.0	20	0	90.4	80 - 120	18.15	0.365	20	
Bromochloromethane	15.08	1.0	20	0	75.4	78 - 123	16.25	7.47	20	S
Bromodichloromethane	16.38	1.0	20	0	81.9	79 - 125	17.06	4.07	20	
Bromoform	18.07	1.0	20	0	90.4	66 - 130	18.99	4.94	20	

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MSD Sample ID: **HS19050082-04MSD** Units: **UG/L** Analysis Date: **13-May-2019 22:09**
Client ID: **67WW11-190501** Run ID: **VOA6_338352** SeqNo: **5073722** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	13.29	1.0	20	0	66.5	53 - 141	15.21	13.5	20	
Carbon disulfide	31.89	2.0	40	0	79.7	64 - 133	34.68	8.38	20	
Carbon tetrachloride	16.24	1.0	20	0	81.2	72 - 136	17.09	5.11	20	
Chlorobenzene	17.58	1.0	20	0	87.9	82 - 118	19.08	8.17	20	
Chloroethane	15.07	1.0	20	0	75.4	60 - 138	16.8	10.8	20	
Chloroform	15.08	1.0	20	0	75.4	79 - 124	16.27	7.62	20	S
Chloromethane	13.67	1.0	20	0	68.4	50 - 139	15.34	11.5	20	
cis-1,2-Dichloroethene	15.07	1.0	20	0	75.4	78 - 123	15.99	5.89	20	S
cis-1,3-Dichloropropene	17.47	1.0	20	0	87.4	75 - 124	18.14	3.77	20	
Dibromochloromethane	17.73	1.0	20	0	88.6	74 - 126	18.69	5.27	20	
Dibromomethane	16.39	1.0	20	0	81.9	79 - 123	17.09	4.23	20	
Dichlorodifluoromethane	13.62	1.0	20	0	68.1	32 - 152	14.6	6.91	20	
Ethylbenzene	17.35	1.0	20	0	86.8	79 - 121	18.84	8.2	20	
Hexachlorobutadiene	19.74	1.0	20	0	98.7	66 - 134	19.78	0.213	20	
Isopropylbenzene	17.86	1.0	20	0	89.3	72 - 131	19.04	6.4	20	
m,p-Xylene	35.44	2.0	40	0	88.6	80 - 121	38.56	8.44	20	
Methylene chloride	15.64	2.0	20	0	78.2	74 - 124	16.93	7.92	20	
Naphthalene	18.29	1.0	20	0	91.4	61 - 128	18	1.6	20	
n-Butylbenzene	18.98	1.0	20	0	94.9	75 - 128	19.52	2.78	20	
n-Propylbenzene	19.28	1.0	20	0	96.4	76 - 126	19.91	3.21	20	
o-Xylene	18.25	1.0	20	0	91.2	78 - 122	19.35	5.87	20	
sec-Butylbenzene	19.61	1.0	20	0	98.0	77 - 126	20.19	2.93	20	
Styrene	17.3	1.0	20	0	86.5	78 - 123	18.44	6.36	20	
tert-Butylbenzene	19.81	1.0	20	0	99.1	78 - 124	20.21	1.97	20	
Tetrachloroethene	17.92	1.0	20	0	89.6	74 - 129	19.61	9	20	
Toluene	17.39	1.0	20	0	86.9	80 - 121	18.68	7.15	20	
trans-1,2-Dichloroethene	15.81	1.0	20	0	79.1	75 - 124	17.21	8.47	20	
trans-1,3-Dichloropropene	16.67	1.0	20	0	83.4	73 - 127	17.11	2.62	20	
Trichloroethene	16.92	1.0	20	0	84.6	79 - 123	18.04	6.42	20	
Trichlorofluoromethane	15.12	1.0	20	0	75.6	65 - 141	16.69	9.9	20	
Vinyl chloride	15.8	1.0	20	0	79.0	58 - 137	17.21	8.56	20	
Surr: 1,2-Dichloroethane-d4	*42.99*	*1.0*	*50*	*0*	*86.0*	*81 - 118*	*44.43*	*3.31*	*20*	
Surr: 4-Bromofluorobenzene	*48.96*	*1.0*	*50*	*0*	*97.9*	*85 - 114*	*49.85*	*1.81*	*20*	
Surr: Dibromofluoromethane	*44.46*	*1.0*	*50*	*0*	*88.9*	*80 - 119*	*45.28*	*1.83*	*20*	

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R338352 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MSD Sample ID: **HS19050082-04MSD** Units: **UG/L** Analysis Date: **13-May-2019 22:09**
Client ID: **67WW11-190501** Run ID: **VOA6_338352** SeqNo: **5073722** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*52.41*	*1.0*	*50*	*0*	*105*	*89 - 112*	*52.44*	*0.0612*	*20*	

The following samples were analyzed in this batch:

HS19050082-01	HS19050082-02	HS19050082-03	HS19050082-04
HS19050082-05	HS19050082-06	HS19050082-07	

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R337814 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MBLK Sample ID: **WBLKW2-050219** Units: **mg/L** Analysis Date: **02-May-2019 21:41**
Client ID: Run ID: **ICS2100_337814** SeqNo: **5061734** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	0.500	0.500								U
Nitrogen, Nitrate (As N)	0.100	0.100								U
Sulfate	0.500	0.500								U

LCS Sample ID: **WLCSW2-050219** Units: **mg/L** Analysis Date: **02-May-2019 21:55**
Client ID: Run ID: **ICS2100_337814** SeqNo: **5061735** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	20.13	0.500	20	0	101	80 - 120				
Nitrogen, Nitrate (As N)	3.932	0.100	4	0	98.3	80 - 120				
Sulfate	20.05	0.500	20	0	100	80 - 120				

LCSD Sample ID: **WLCSDW2-050219** Units: **mg/L** Analysis Date: **02-May-2019 22:10**
Client ID: Run ID: **ICS2100_337814** SeqNo: **5061736** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.37	0.500	20	0	96.8	80 - 120	20.13	3.87	20	
Nitrogen, Nitrate (As N)	3.798	0.100	4	0	95.0	80 - 120	3.932	3.47	20	
Sulfate	19.23	0.500	20	0	96.2	80 - 120	20.05	4.17	20	

MS Sample ID: **HS19041545-10MS** Units: **mg/L** Analysis Date: **03-May-2019 03:32**
Client ID: Run ID: **ICS2100_337814** SeqNo: **5061745** PrepDate: DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	65.95	2.50	50	15.1	102	80 - 120				
Nitrogen, Nitrate (As N)	10.49	0.500	10	1.055	94.4	80 - 120				
Sulfate	133.5	2.50	50	78.44	110	80 - 120				

ALS Houston, US Date: 17-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050082

QC BATCH REPORT

Batch ID: R337814 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MS Sample ID: **HS19041537-01MS** Units: **mg/L** Analysis Date: **02-May-2019 23:08**
Client ID: Run ID: **ICS2100_337814** SeqNo: **5061738** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	27.68	0.500	10	16.95	107	80 - 120				
Nitrogen, Nitrate (As N)	5.895	0.100	2	3.586	115	80 - 120				
Sulfate	86.19	0.500	10	75.01	112	80 - 120				O

MSD Sample ID: **HS19041545-10MSD** Units: **mg/L** Analysis Date: **03-May-2019 03:47**
Client ID: Run ID: **ICS2100_337814** SeqNo: **5061746** PrepDate: DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	65.05	2.50	50	15.1	99.9	80 - 120	65.95	1.37	20	
Nitrogen, Nitrate (As N)	10.3	0.500	10	1.055	92.5	80 - 120	10.49	1.81	20	
Sulfate	129.9	2.50	50	78.44	103	80 - 120	133.5	2.69	20	

MSD Sample ID: **HS19041537-01MSD** Units: **mg/L** Analysis Date: **02-May-2019 23:23**
Client ID: Run ID: **ICS2100_337814** SeqNo: **5061739** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	26.91	0.500	10	16.95	99.6	80 - 120	27.68	2.81	20	
Nitrogen, Nitrate (As N)	5.777	0.100	2	3.586	110	80 - 120	5.895	2.02	20	
Sulfate	0.5000	0.500	10	75.01	0	80 - 120	86.19	0	20	U

The following samples were analyzed in this batch: HS19050082-01 HS19050082-02 HS19050082-03

ALS Houston, US Date: 17-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**QUALIFIERS, ACRONYMS, UNITS**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
WorkOrder:	**HS19050082**	

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Illinois	004438	29-Jun-2019
Louisiana	03087	30-Jun-2019
Dept of Defense	ANAB L2231	20-Dec-2021
Kansas	E-10352 2018-2019	31-Jul-2019
Oklahoma	2018-156	31-Aug-2019
North Carolina	624-2019	31-Dec-2019
Maryland	343, 2018-2019	30-Jun-2019
Arkansas	19-028-0	27-Mar-2020
Texas	TX104704231-19-23	30-Apr-2020

ALS Houston, US Date: 17-May-19

Sample Receipt Checklist

Client Name:	CBI-Houston	Date/Time Received:	**02-May-2019 08:51**
Work Order:	HS19050082	Received by:	**NDR**

Checklist completed by: *Raegen Giga* (eSignature) 2-May-2019 (Date)

Reviewed by: *Corey Grandits* (eSignature) 2-May-2019 (Date)

Matrices: **GW**

Carrier name: **FedEx Priority Overnight**

Question	Yes	No	Not Present
Shipping container/cooler in good condition?	☑	☐	☐
Custody seals intact on shipping container/cooler?	☑	☐	☐
Custody seals intact on sample bottles?	☐	☐	☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	
Samplers name present on COC?	☑	☐	
Chain of custody agrees with sample labels?	☐	☑	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	1.5c/ uc/c	IR 11
Cooler(s)/Kit(s):	44900	
Date/Time sample(s) sent to storage:	05/02/2019 11:15	

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

pH adjusted by:

Login Notes: 67WW02-190501 - COC = 3 vials , Rec'd 6 HCL Vials for this sample

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

00954832

APTIM

COC ID: LHAAP67-MAY2019-ALS | TURNAROUND TIME: | Page 1 of | RUSH:

PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name	Longhorn AAP	Lab Name	ALS Laboratories	Email Invoice To	FedInvoices@aptim.com
Project Number	501032	Lab Contact	RJ Modashia		
	LHAAP-67	Email	RJ.Modashia@alsglobal.com	Email Report To	Susan.Huang@aptim.com
Address	1203-B East Grand Avenue	Address	10450 Stancliff Rd., Suite 210	Mail Reports To	Susan Huang
	PMB 202			Address	4005 Port Chicago Highway, Suite 200
City	Marshall State TX	City	Houston State TX	City	Concord State CA
Postal Code	75670 Country USA	Postal Code	77099 Country USA	Postal Code	94520 Country USA
Phone Number	713.243.7264	Phone Number	281.575.2279 or 281.530.5656		
Project Manager	Praveen Srivastav			Shipping Company	

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	Vocs by 8260B (3-40 ml VOA/HCL)	MEE by RSK175 (3-40 ml VOA/HCL)	CO2 by RSK175 (3-40 ml VOA/Cool to 6 deg C)	TOC by Sm5310C (2-40ml Amber/H2SO4)	Anions (chloride/sulfate/nitrate) by 9056 (1-250ml /Cool to 6 deg C)
67WW13-190501	LHAAP 67	20.18	20.40		WG	5/1/19	0800	12	X	X	X	X	X
67WW13-190501-FD	LHAAP 67	20.18	20.40		WG	5/1/19	0800	12	X	X	X	X	X
67WW08-190501	LHAAP 67	21.67	21.90		WG	5/1/19	0900	12	X	X	X	X	X
67WW11-190501	LHAAP 67	21.21	21.44		WG	5/1/19	0955	3	X				
67WW16I-190501	LHAAP 67	21.80	21.98		WG	5/1/19	1045	3	X				
67WW02-190501	LHAAP 67	22.42	26.67		WG	5/1/19	1135	3	X				
TRip BLANK	LHAAP 67				W	5/1/19		2	X				

HS19050082
Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
[signature] /BHATE	5/1/19 1245	NA	5.2.19 08:51

44900 ~~44900~~ 5.2.19 Temp. u/c 1.5.

IR # 11 c/f 9

00954833

THU - 02 MAY 10:30A

TRK# 0221 4809 7833 1030 PRIORITY OVERNIGHT

XH SGRA

77099
TX-US
IAH

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

CUSTODY SEAL

Date: 5/1/19 Time: 1430
Name: Scott Bessinger
Company: B H Arc

Seal Broken By: [illegible]
Date: 5/2/19

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
www.alsglobal.com

LABORATORY REPORT

May 17, 2019

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

RE: HS19050082

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on May 3, 2019. For your reference, these analyses have been assigned our service request number P1902518.

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. 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

Hayden Akers

By Hayden Akers at 11:12, May 17, 2019

Hayden Akers
Project Manager

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
www.alsglobal.com

Client: ALS Laboratory Group
Project: HS19050082

Service Request No: P1902518

CASE NARRATIVE

The samples were received intact under chain of custody on May 3, 2019 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 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 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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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Alaska DEC	http://dec.alaska.gov/eh/lab.aspx	17-019
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/page/la-lab-accreditation	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml	2018027
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1521096
New Jersey DEP (NELAP)	http://www.nj.gov/dep/enforcement/oqa.html	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-006
Pennsylvania DEP	http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html	T104704413-18-9
Utah DOH (NELAP)	http://health.utah.gov/lab/lab_cert_env	CA016272018-9
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	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, 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

Service Request: P1902518

Project ID: HS19050082

Date Received: 5/3/2019

Time Received: 09:04

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	RSK 175 - CO2	RSK 175 - Gases
67WW13-190501	P1902518-001	Water	5/1/2019	08:00	X	X
67WW13-190501 FD	P1902518-002	Water	5/1/2019	08:00	X	X
67WW08-190501	P1902518-003	Water	5/1/2019	08:00	X	X

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Houston, TX 77099
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Subcontract Chain of Custody

P1902518

SAMPLING STATE: **Texas**

COC ID: **11237**

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:	HS19050082
TSR:	Sonia West

	LAB SAMPLE ID / ANALYSIS REQUESTED	CLIENT SAMPLE ID	MATRIX	COLLECT DATE / DUE DATE
1.	**HS19050082-01**	**67WW13-190501**	**Groundwater**	**01 May 2019 08:00**
	MEE + CO2. DOD IV. Equis EDD. EQuIS 5.0 - Longhorn			16 May 2019
2.	**HS19050082-02**	**67WW13-190501 FD**	**Groundwater**	**01 May 2019 08:00**
	MEE + CO2. DOD IV. Equis EDD. EQuIS 5.0 - Longhorn			16 May 2019
3.	**HS19050082-03**	**67WW08-190501**	**Groundwater**	**01 May 2019 08:00**
	MEE + CO2. DOD IV. Equis EDD. EQuIS 5.0 - Longhorn			16 May 2019

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

QC Level: DOD IV (DoD Data Package)

Relinquished By:		Date/Time:	5/2/19 1800
Received By:	Chris	Date/Time:	5-3-19 0904
Cooler ID(s):		Temperature(s):	

10450 Stancliff Rd, Ste 210
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Purchase Order

P1902518

PO: HS19050082

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: 11237
TSR: Sonia West

Item	Catalog No	Unit Price	Quantity	Ext Price
1. MEE + CO2. DOD IV. Equis EDD. EQuIS 5.0 - Longhorn	NA	$41.25	3	$123.75

Order Total: $123.75

ALS Environmental
Sample Acceptance Check Form

Client: ALS Laboratory Group Work order: P1902518
Project: HS190500823
Sample(s) received on: 5/3/19 Date opened: 5/3/19 by: CHRIS.GLEASON

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.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature: 3° C Blank Temperature: ° C Thermometer ID T-111	Wet Ic		
8	Were **custody seals** on outside of cooler/Box/Container?	☒	☐	☐
	Location of seal(s)? Sealing Lid of Cooler Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☒	☐	☐
	Were **VOA vials** checked for presence/absence of air bubbles?	☒	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☒	☐
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1902518-001.01	40mL VOA NP		7		A	wh 5/13/19
P1902518-001.02	40mL VOA NP				A	
P1902518-001.03	40mL VOA NP				A	
P1902518-001.04	40ml VOA HCL		1		A	wh 5/7/19
P1902518-001.05	40ml VOA HCL				A	
P1902518-001.06	40ml VOA HCL				A	
P1902518-002.01	40mL VOA NP		7		A	wh 5/13/19
P1902518-002.02	40mL VOA NP				A	
P1902518-002.03	40mL VOA NP				A	
P1902518-002.04	40ml VOA HCL		1		A	wh 5/7/19
P1902518-002.05	40ml VOA HCL				A	
P1902518-002.06	40ml VOA HCL				A	
P1902518-003.01	40mL VOA NP		7		A	wh 5/13/19
P1902518-003.02	40mL VOA NP				A	
P1902518-003.03	40mL VOA NP				A	

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

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS Environmental
Sample Acceptance Check Form

Client: ALS Laboratory Group   Work order: P1902518
Project: HS190500823
Sample(s) received on: 5/3/19   Date opened: 5/3/19   by: CHRIS.GLEASON

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1902518-003.04	40ml VOA HCL		1		A	wh 5/7/19
P1902518-003.05	40ml VOA HCL				A	
P1902518-003.06	40ml VOA HCL				A	

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

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
Page 1 of 1

Client: **ALS Laboratory Group**
Client Project ID: **HS19050082**
ALS Project ID: P1902518

Carbon Dioxide

Test Code: RSK 175
Instrument ID: HP5890A/GC10/TCD
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date(s) Collected: 5/1/19
Date Received: 5/3/19
Date Analyzed: 5/13/19

Client Sample ID	ALS Sample ID	Injection Volume ml(s)	**Result µg/L**	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
67WW13-190501	P1902518-001	0.050	**840,000**	2,000	1,700	740	
67WW13-190501 FD	P1902518-002	0.050	**860,000**	2,000	1,700	740	
67WW08-190501	P1902518-003	0.050	**270,000**	2,000	1,700	740	
Method Control Sample	P190513-MB	0.10	860	1,000	860	370	**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: **HS19050082**

ALS Project ID: P1902518
ALS Sample ID: P190513-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: 5/13/19
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount LCS / DLCS ug/L	Result[1] LCS ug/L	Result[1] DLCS ug/L	**% Recovery LCS**	**% Recovery DLCS**	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
124-38-9	Carbon Dioxide	22,900	19,300	20,200	**84**	**88**	80-122	5	12	

[1] = 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: **67WW13-190501**
Client Project ID: **HS19050082**

ALS Project ID: P1902518
ALS Sample ID: P1902518-001

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 5/1/19
Date Received: 5/3/19
Date Analyzed: 5/7/19
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: **67WW13-190501 FD**
Client Project ID: **HS19050082**

ALS Project ID: P1902518
ALS Sample ID: P1902518-002

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 5/1/19
Date Received: 5/3/19
Date Analyzed: 5/7/19
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: **67WW08-190501**
Client Project ID: **HS19050082**

ALS Project ID: P1902518
ALS Sample ID: P1902518-003

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 5/1/19
Date Received: 5/3/19
Date Analyzed: 5/7/19
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	**2.5**	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: **Method Control Sample**
Client Project ID: **HS19050082**

ALS Project ID: P1902518
ALS Sample ID: P190507-MB

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 5/07/19
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: **HS19050082**

ALS Project ID: P1902518
ALS Sample ID: P190507-LCS
P190507-DLCS

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 5/07/19
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Spike Amount LCS / DLCS µg/L	Result[1] LCS µg/L	Result[1] DLCS µg/L	% Recovery LCS	% Recovery DLCS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
74-82-8	Methane	2.50	2.53	2.52	**101**	**101**	73-125	0	26	
74-85-1	Ethene	4.37	4.41	4.54	**101**	**104**	72-133	3	11	
74-84-0	Ethane	4.69	4.59	4.77	**98**	**102**	74-131	4	10	

[1] = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131907.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 12:13:16
Operator : WH
Sample : P1902518-001 50ul
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 12:34:14 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

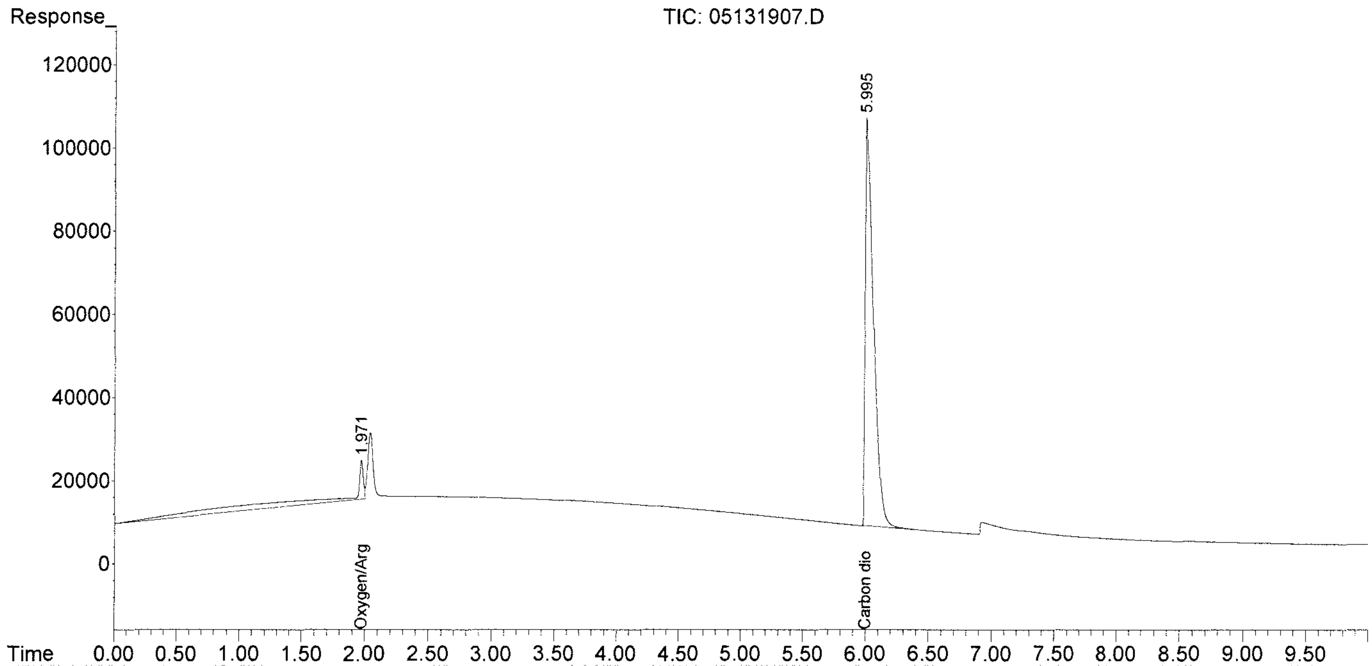
	Compound	R.T.	Response	Conc	Units
	Target Compounds				
1)	Oxygen/Argon	1.972f	1155474	0.243	ppm
2)	Carbon monoxide	1.972f	1155474	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	5.997	4505713	19195.365	ppm
6)	Methane (FID)	0.000	0	N.D.	ppm
7)	Ethylene	0.000	0	N.D.	ppm
8)	Ethane	0.000	0	N.D.	ppm
9)	Propylene	0.000	0	N.D.	ppm
10)	Propane	0.000	0	N.D.	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

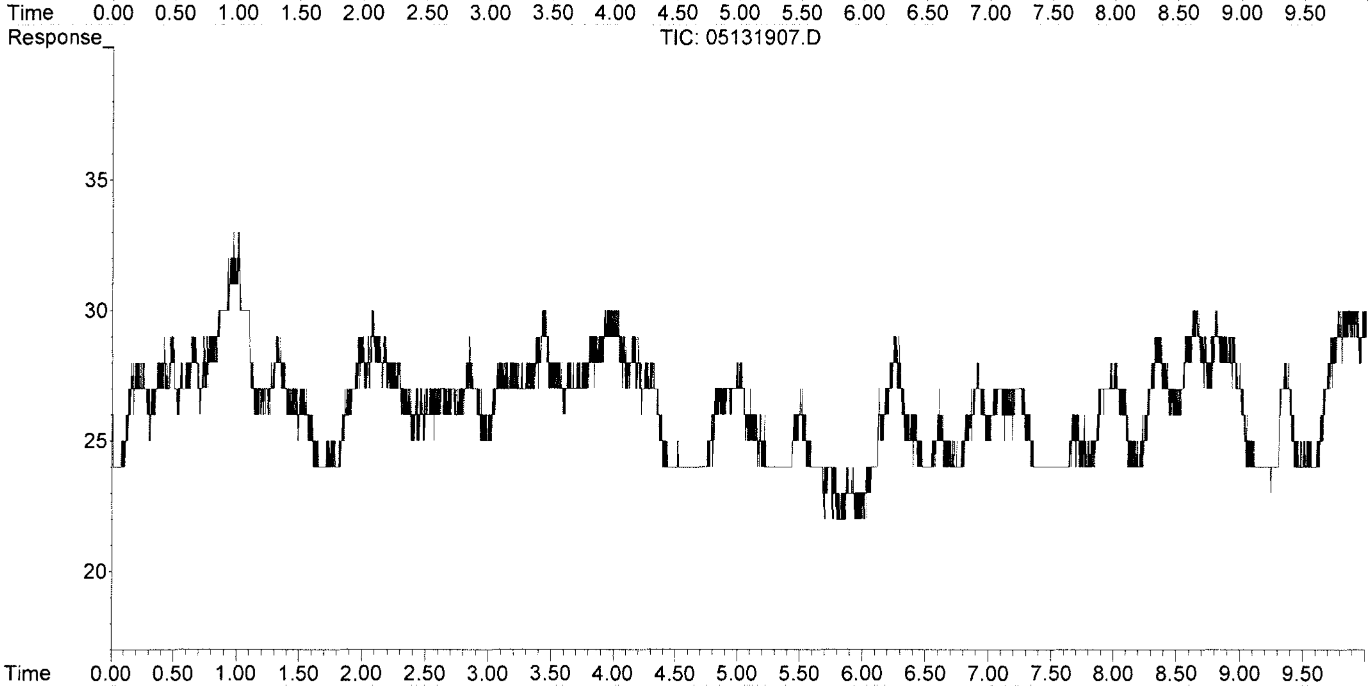
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131907.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 13-May-2019, 12:13:16
Operator  : WH
Sample    : P1902518-001 50ul
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 12:34:14 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131908.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 12:26:26
Operator : WH
Sample : P1902518-002 50ul
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 12:34:26 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

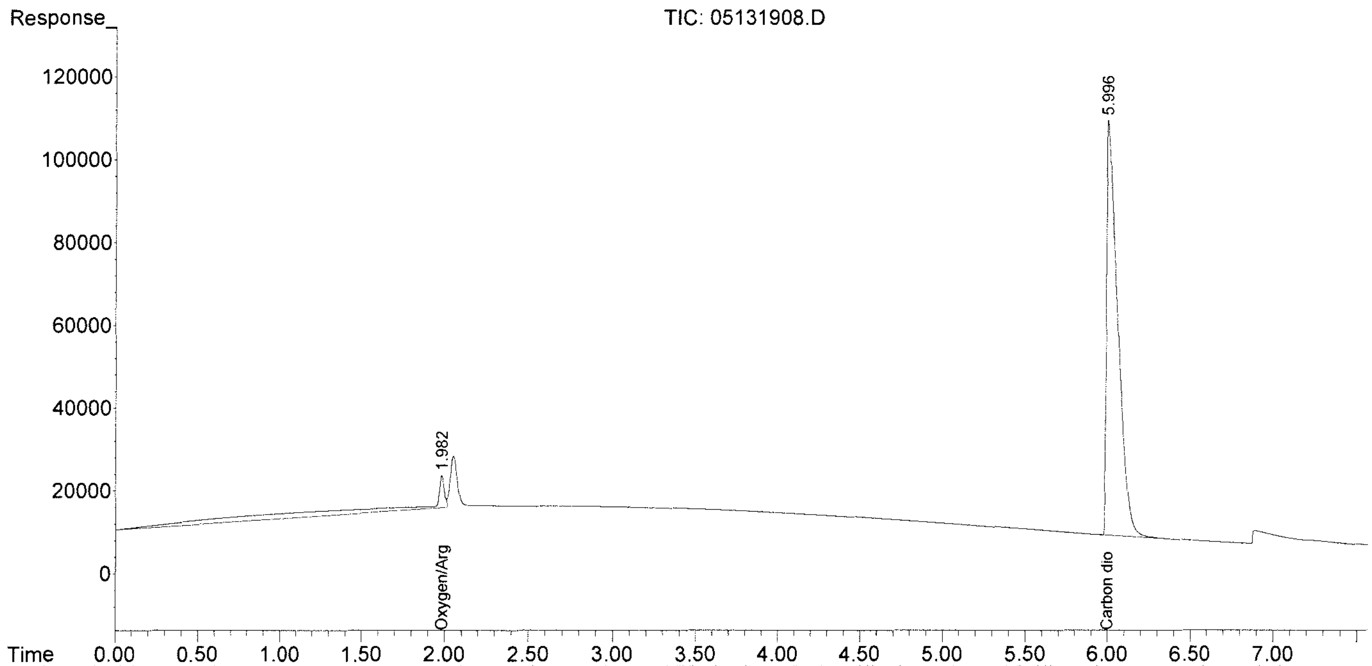
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	1.982f	1162636	0.244	ppm
2)	Carbon monoxide	1.982f	1162636	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	5.997	4628903	19720.184	ppm
6)	Methane (FID)	0.000	0	N.D.	ppm
7)	Ethylene	0.000	0	N.D.	ppm
8)	Ethane	0.000	0	N.D.	ppm
9)	Propylene	0.000	0	N.D.	ppm
10)	Propane	0.000	0	N.D.	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

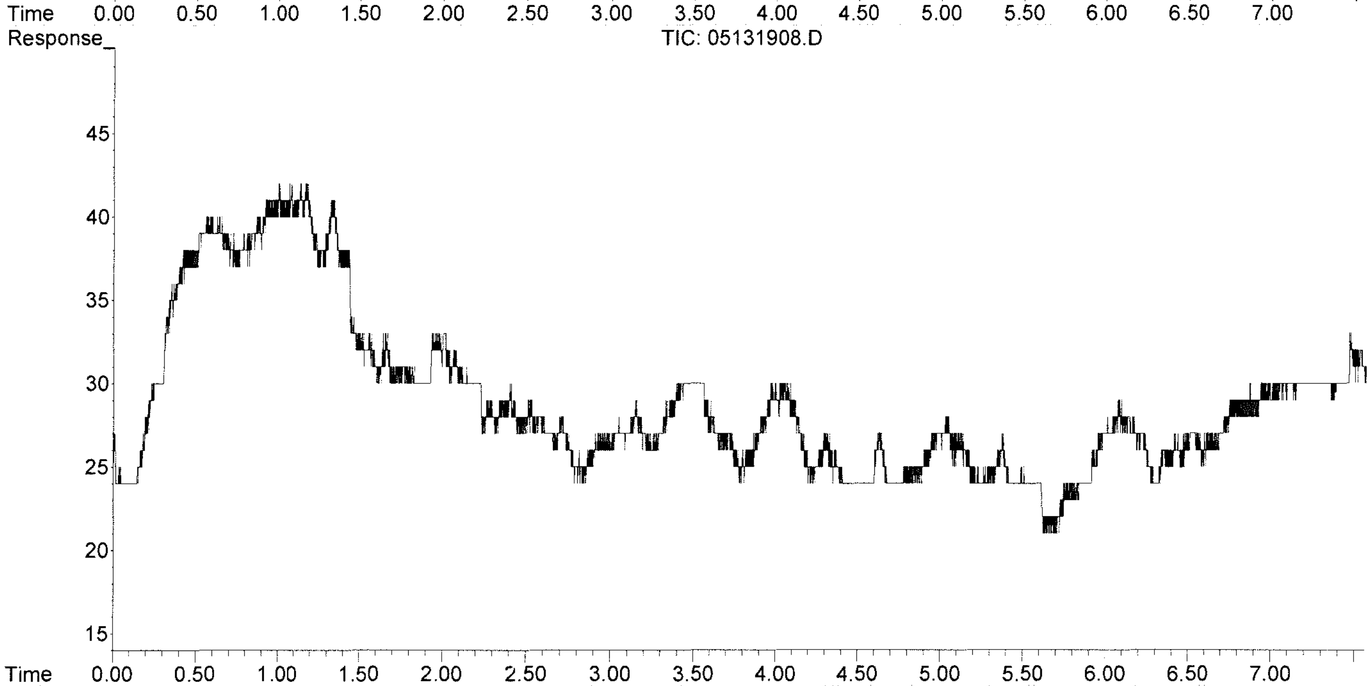
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131908.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 13-May-2019, 12:26:26
Operator  : WH
Sample    : P1902518-002 50ul
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 12:34:26 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131909.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 12:36:10
Operator : WH
Sample : P1902518-003 50ul
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 14 11:35:45 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

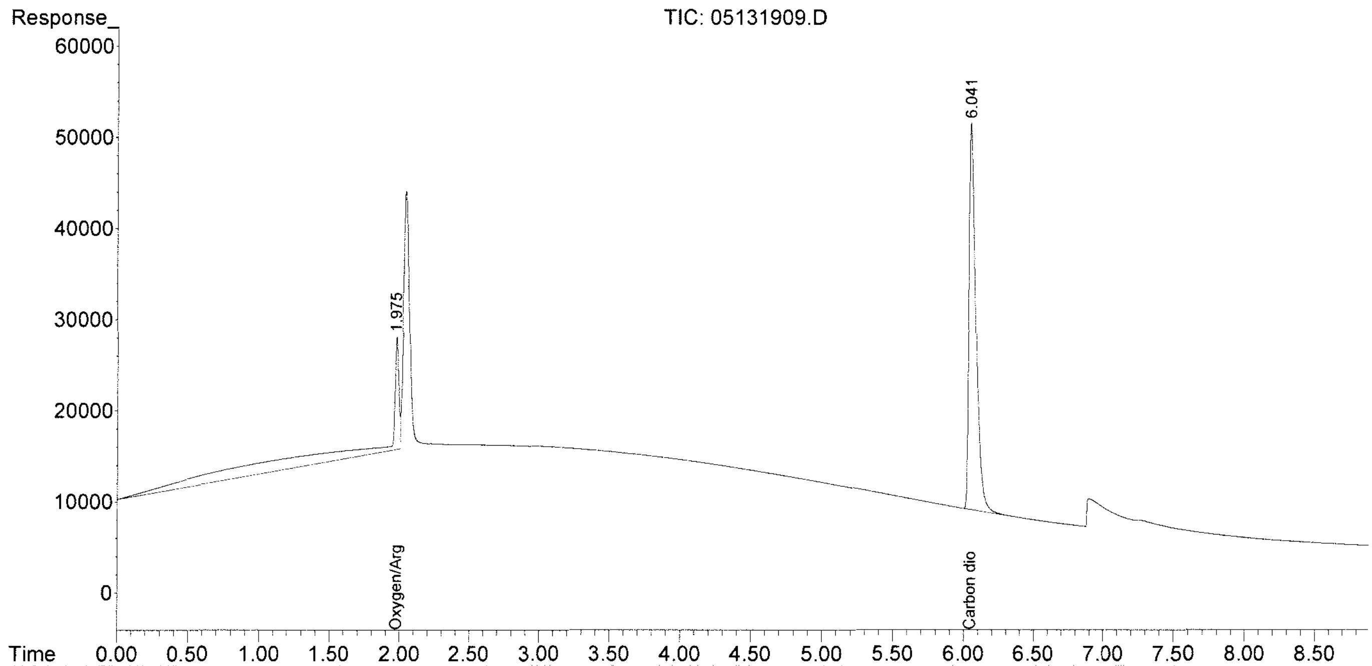
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	1.976f	1189741	0.250	ppm
2)	Carbon monoxide	1.976f	1189741	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	6.042	1468406	6255.744	ppm
6)	Methane (FID)	0.000	0	N.D.	ppm
7)	Ethylene	0.000	0	N.D.	ppm
8)	Ethane	0.000	0	N.D.	ppm
9)	Propylene	0.000	0	N.D.	ppm
10)	Propane	0.000	0	N.D.	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

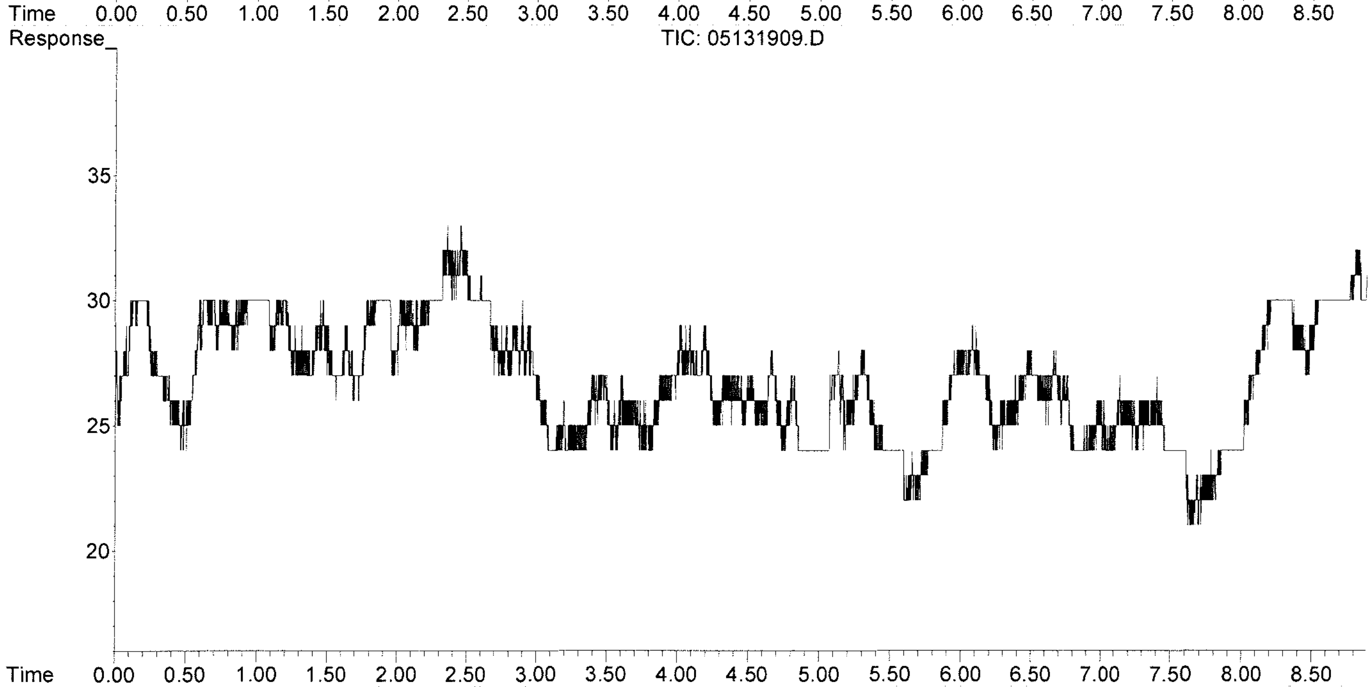
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131909.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 12:36:10
Operator : WH
Sample : P1902518-003 50ul
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 14 11:35:45 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131903.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 11:08:12
Operator : WH
Sample : mcs 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 14 10:48:07 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

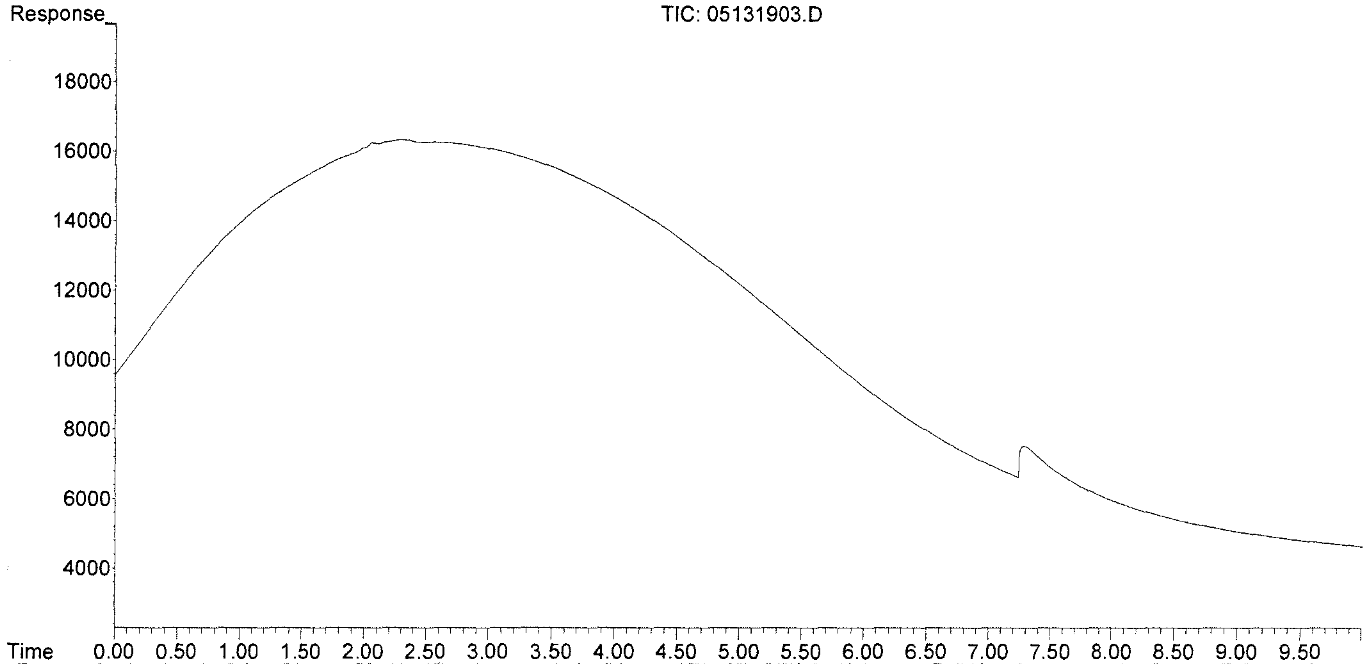
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	0.000	0	N.D.	ppm
2)	Carbon monoxide	0.000	0	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	0.000	0	N.D.	ppm
7)	Ethylene	0.000	0	N.D.	ppm
8)	Ethane	0.000	0	N.D.	ppm
9)	Propylene	0.000	0	N.D.	ppm
10)	Propane	0.000	0	N.D.	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

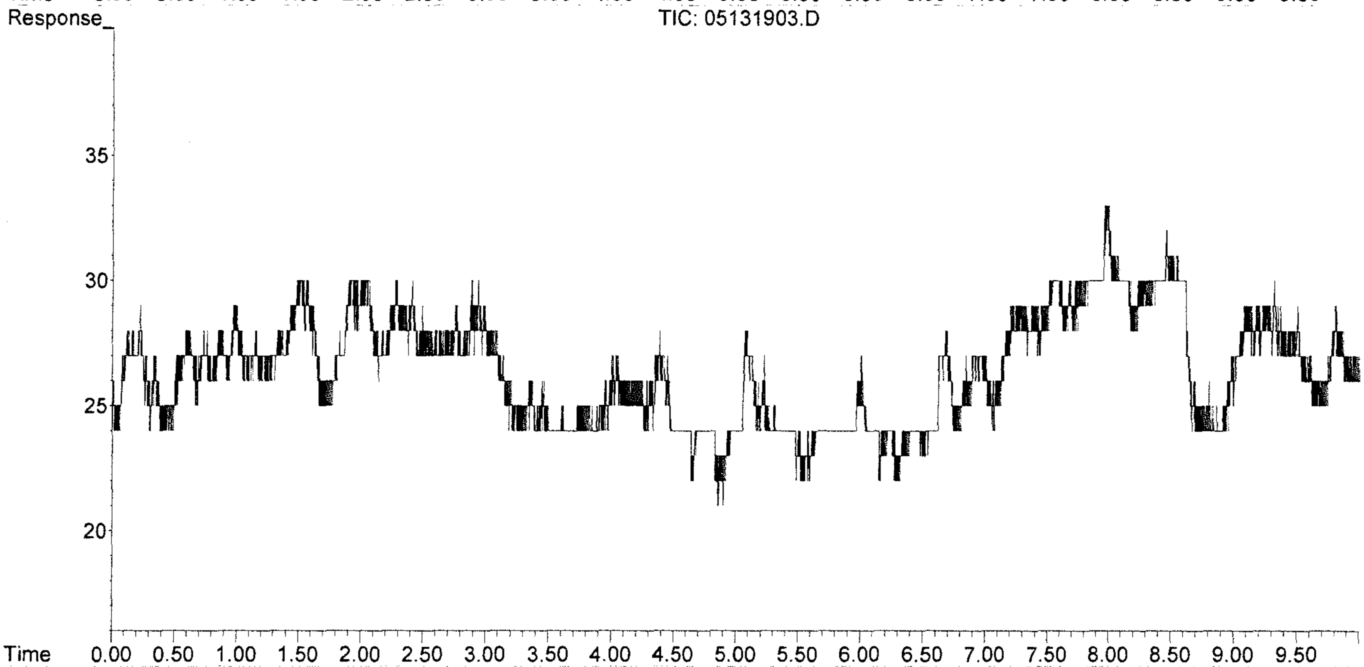
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131903.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 13-May-2019, 11:08:12
Operator  : WH
Sample    : mcs 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 14 10:48:07 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131904.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 11:26:21
Operator : WH
Sample : lcs tcd 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 11:36:14 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

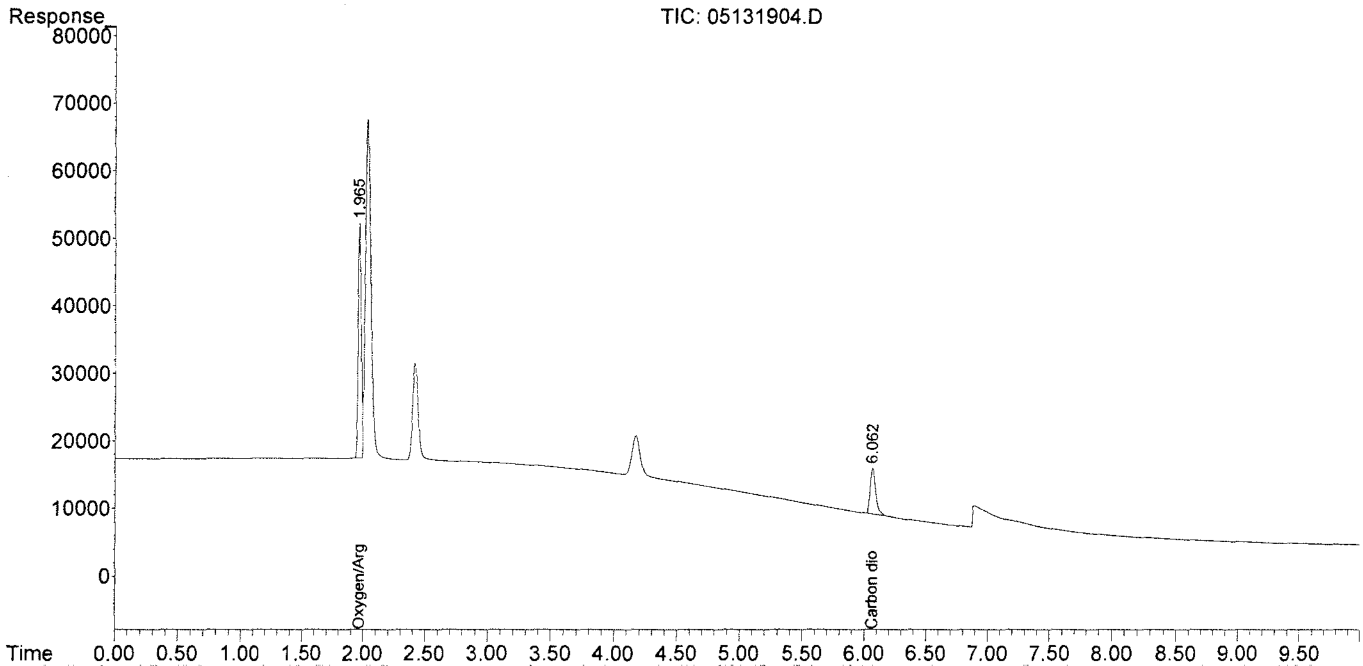
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	1.965f	612499	0.129	ppm	
2)	Carbon monoxide	1.965f	612499	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	6.062	207232	882.856	ppm	m
6)	Methane (FID)	0.000	0	N.D.	ppm	
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

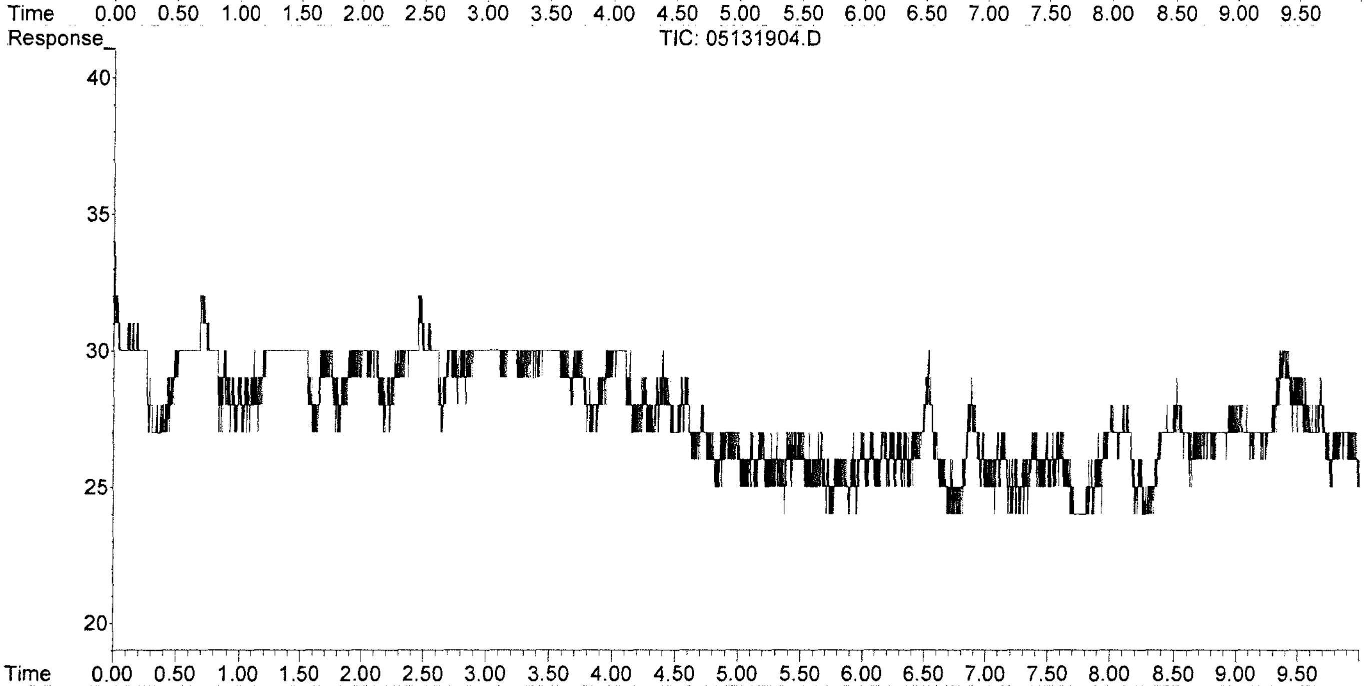
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131904.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 11:26:21
Operator : WH
Sample : lcs tcd 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 11:36:14 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

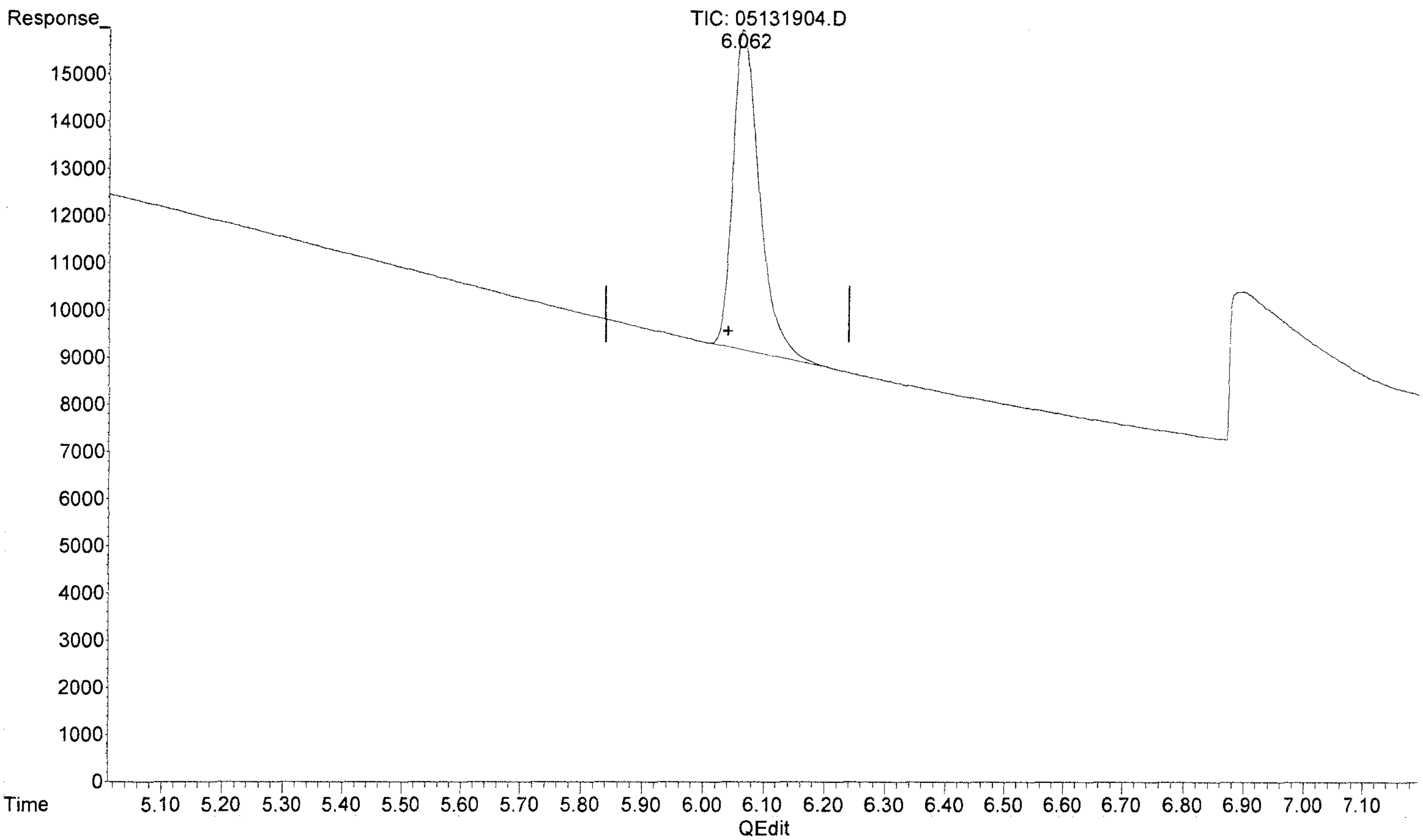




Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131904.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 11:26:21
Operator : WH
Sample : lcs tcd 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 11:36:14 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide
6.062min 882.856 ppm m
response 207232

MR 5/14/19

WS 5/14/19 BLC no previous

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131905.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 11:41:14
Operator : WH
Sample : lcsd tcd 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 11:59:16 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

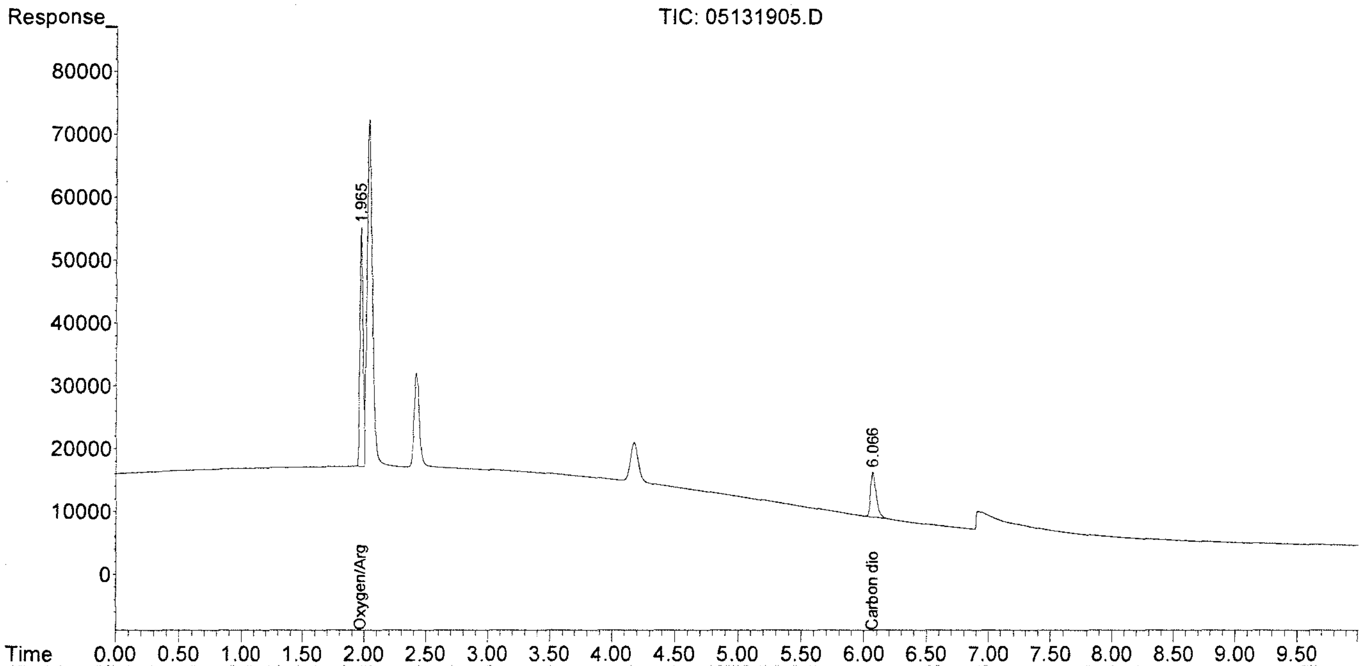
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	1.966f	665150	0.140	ppm	
2)	Carbon monoxide	1.966f	665150	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	6.066	217080	924.812	ppm	m
6)	Methane (FID)	0.000	0	N.D.	ppm	
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

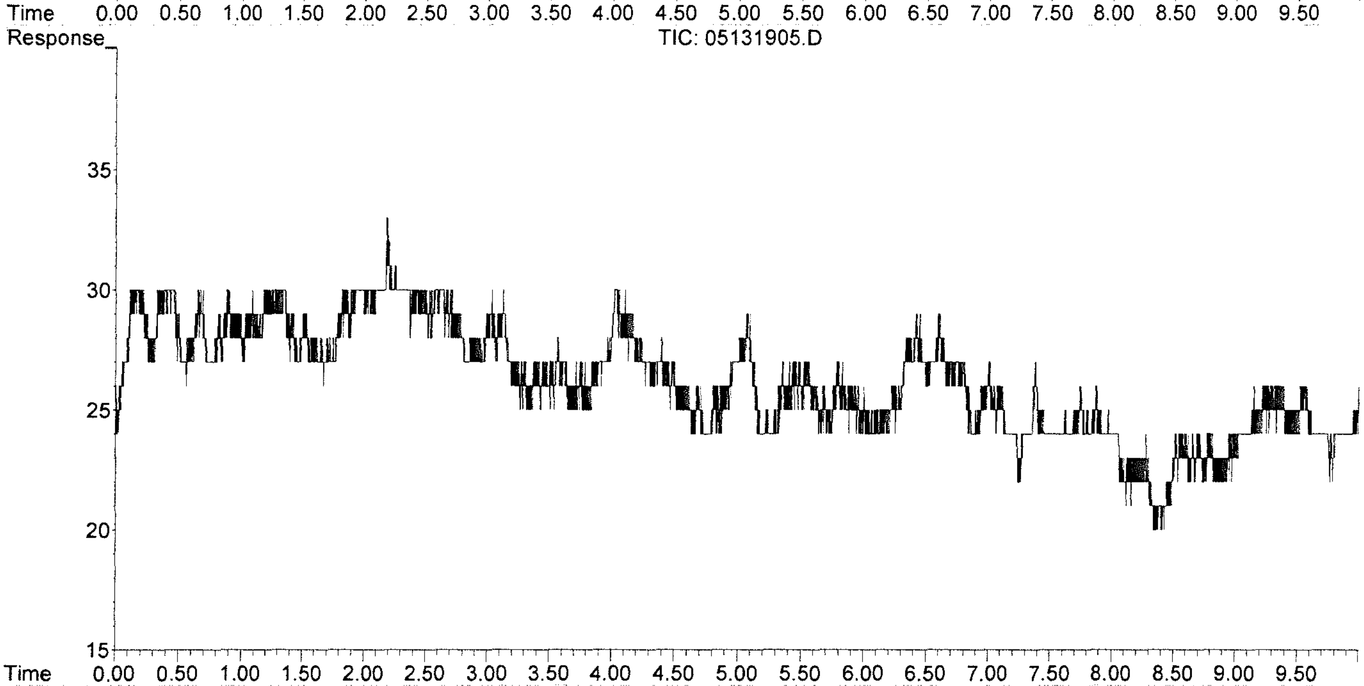
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131905.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 11:41:14
Operator : WH
Sample : lcsd tcd 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 11:59:16 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

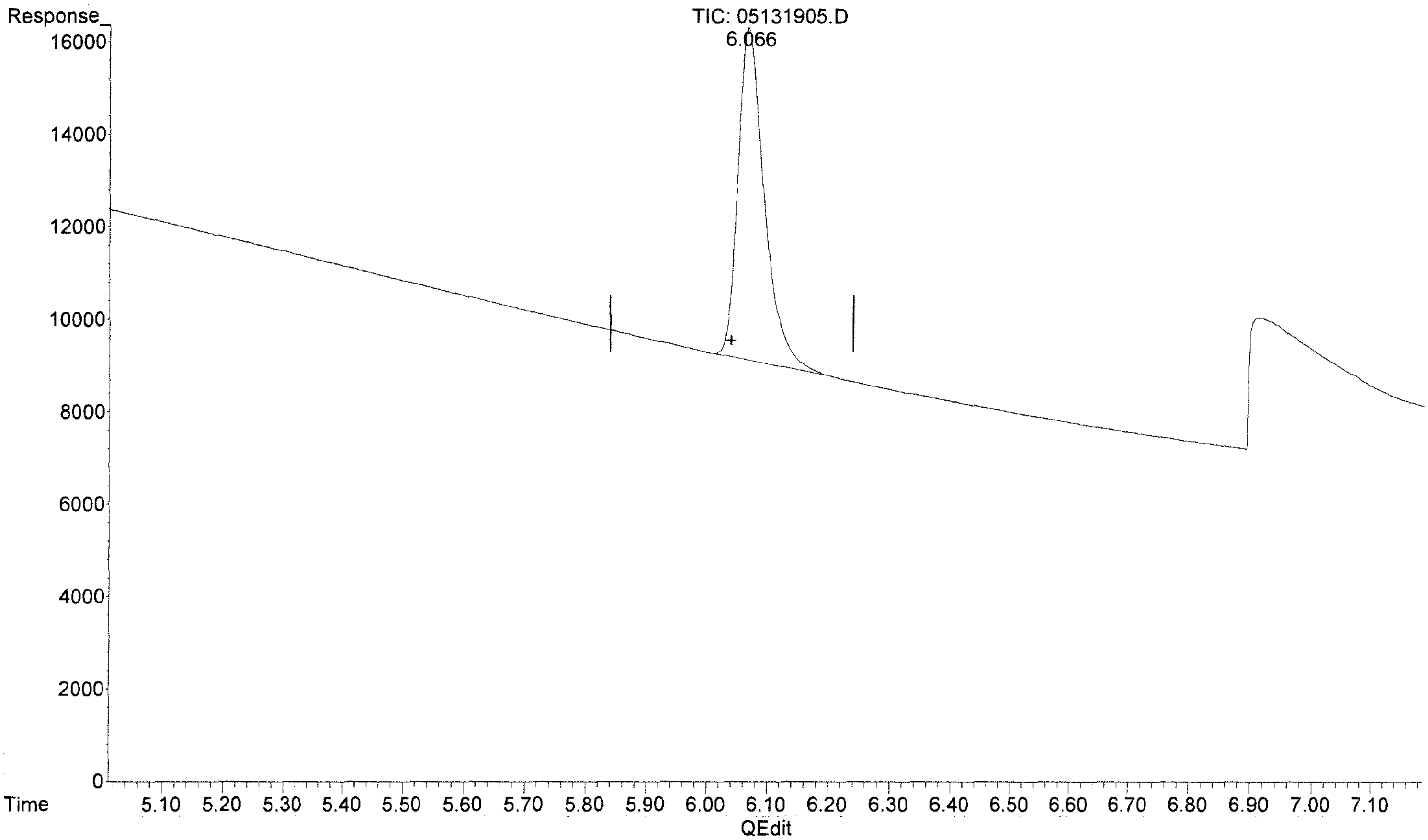




Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131905.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 11:41:14
Operator : WH
Sample : lcsd tcd 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 11:59:16 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide

6.066min 924.812 ppm m

response 217080

MR 5/14/19

WH 5/14/19 BLC no previous

(+) = Expected Retention Time

Method Path : I:\GC10\METHODS\
Method File : RS082817_CO2.M
Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
Last Update : Tue Aug 29 16:13:13 2017
Response Via : Initial Calibration

Calibration Files

1	=08291715.D	2	=08291716.D	3	=08291717.D
4	=08291719.D	5	=08291720.D	6	=08291721.D

	Compound	1	2	3	4	5	6	Avg		%RSD
1)	Oxygen/Argon	4.760						4.760	E6	0.00
2)	Carbon monoxide	2.775		1.066	0.043	0.033	0.027	0.657	E6	170.12
3)	Methane (TCD)							9.457		0.00
4)	Carbon dioxide	2.717	2.193	2.338	2.272	2.265	2.298	2.347	E2	7.99

Signal #2 Calibration Files

1	=08291715.D	2	=08291716.D	3	=08291717.D
4	=08291719.D	5	=08291720.D	6	=08291721.D

	Compound	1	2	3	4	5	6	Avg		%RSD
6)	Methane (FID)	1.253	1.160	1.005	0.927	0.848	0.848	0.945	E4	15.85
7)	Ethylene	1.677	1.605	1.900	1.749	1.597	1.579	1.684	E4	7.30
8)	Ethane	1.769	1.631	1.866	1.767	1.639	1.667	1.723	E4	5.40
9)	Propylene	2.402	2.309	2.767	2.551	2.331	2.333	2.449	E4	7.32
10)	Propane	2.906	2.737	2.817	2.639	2.410	2.420	2.655	E4	7.75
11)	Isobutylene							0.000		-1.00
12)	Isobutane							0.000		-1.00
13)	n-Butane							0.000		-1.00

(#) = Out of Range ### Number of calibration levels exceeded format ###

RS082817_CO2.M Wed Aug 30 13:24:19 2017

dit Compounds -- Compound #4 -- Carbon dioxide

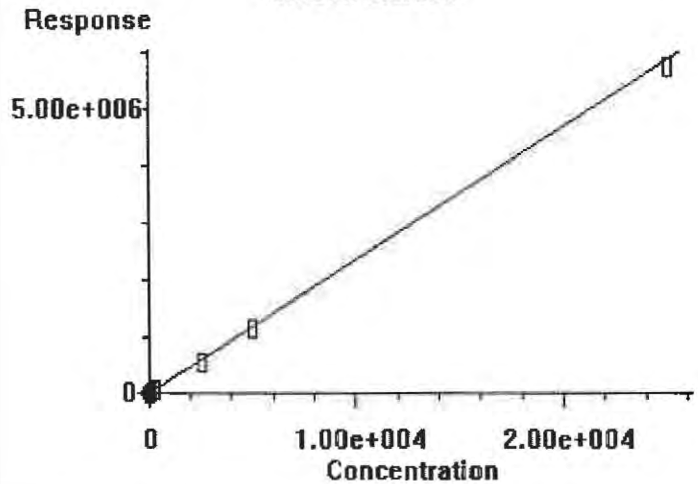
Search by: Ret Time | Name | Index | Find Compound

- Compound Database
- External Standard Compoun
  - Oxygen/Argon
  - Carbon monoxide
  - Methane (TCD)
  - Carbon dioxide
  - Signal #2
  - Methane (FID)
  - Ethylene
  - Ethane
  - Propylene
  - Propane
  - Isobutylene
  - Isobutane
  - n-Butane

Identification | Calibration | User-Defined | Advanced | Reporting

Lvl ID	Concentration	Response	Lvl ID	Concentration	Response
1	25.000000	6793.665186			
2	100.000000	21932.418000			
3	250.000000	58460.642510			
4	2500.000000	568043.388750			
5	5000.000000	1132363.215937			
6	25000.000000	5744294.891563			
7	25000.000000				
8	25000.000000				
9	2000.000000				
10	30000.000000				

Carbon dioxide



0.000e+000	Quadratic term
2.347e+002	Linear term
0.000e+000	Constant term
7.987%	RF Rel Std Dev

OK | Cancel | Help | Print Calibration Curve | Copy Calibration Curve

Method Path : I:\GC10\METHODS\
Method File : RS082817_CO2.M
Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
Last Update : Tue Aug 29 16:13:13 2017
Response Via : Initial Calibration

#	ID	Conc	ISTD Conc	Path\File
1	1	0	0	J:\GC10\DATA\RSK_FID\2017_08\29\08291715.D
2	2	0	0	J:\GC10\DATA\RSK_FID\2017_08\29\08291716.D
3	3	3	0	J:\GC10\DATA\RSK_FID\2017_08\29\08291717.D
4	4	10	0	J:\GC10\DATA\RSK_FID\2017_08\29\08291719.D
5	5	25	0	J:\GC10\DATA\RSK_FID\2017_08\29\08291720.D
6	6	125	0	J:\GC10\DATA\RSK_FID\2017_08\29\08291721.D
7	7	5000	0	J:\GC10\DATA\RSK_FID\2017_08\24\08241708.D
8	8	25000	0	J:\GC10\DATA\RSK_FID\2017_08\24\08241709.D
9	9	2000	0	J:\GC10\DATA\RSK_FID\2017_08\24\08241710.D
10	10	30000	0	J:\GC10\DATA\RSK_FID\2017_08\24\08241711.D

#	ID	Update Time	Quant Time	Acquisition Time
1	1	Aug 29 14:21 2017	Aug 29 14:20 2017	29-Aug-2017, 14:07
2	2	Aug 29 14:52 2017	Aug 29 14:51 2017	29-Aug-2017, 14:22
3	3	Aug 29 15:04 2017	Aug 29 15:04 2017	29-Aug-2017, 14:53
4	4	Aug 29 15:36 2017	Aug 29 15:36 2017	29-Aug-2017, 15:23
5	5	Aug 29 15:57 2017	Aug 29 15:57 2017	29-Aug-2017, 15:44
6	6	Aug 29 16:13 2017	Aug 29 16:13 2017	29-Aug-2017, 16:00
7	7	Aug 25 09:05 2017	Aug 24 16:00 2017	24-Aug-2017, 15:44
8	8	Aug 25 09:06 2017	Aug 24 16:13 2017	24-Aug-2017, 16:02
9	9	Aug 25 09:06 2017	Aug 24 16:31 2017	24-Aug-2017, 16:16
10	10	Aug 25 09:07 2017	Aug 24 16:42 2017	24-Aug-2017, 16:33

RS082817_CO2.M Wed Aug 30 13:24:30 2017

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291715.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 14:07
Operator : MC
Sample : 25ppm s32-08291701 0.25ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 14:20:06 2017
Quant Method : I:\GC10\METHODS\RS082417.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Fri Aug 25 09:19:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

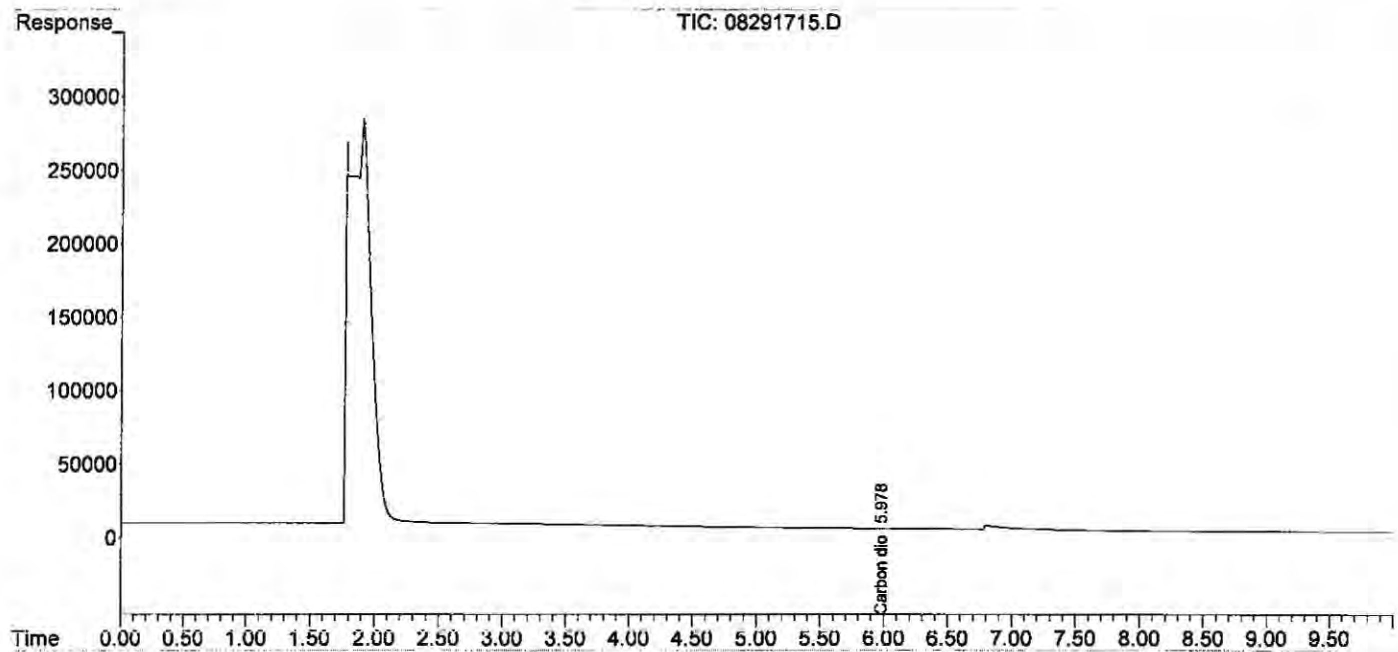
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	0.000	0	N.D.	ppm	d
2)	Carbon monoxide	1.776	277465	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	5.978	6794	27.870	ppm	m
6)	Methane (FID)	0.000	0	N.D.	ppm	d
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

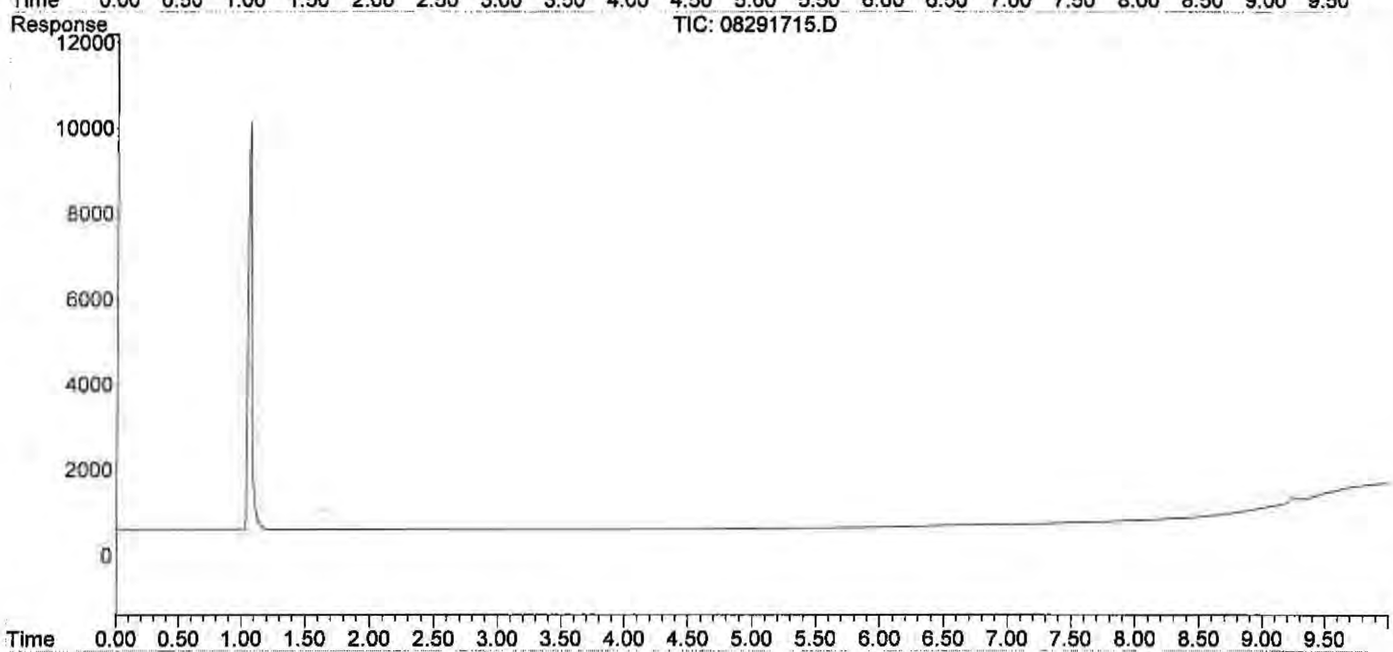
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291715.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 14:07
Operator : MC
Sample : 25ppm s32-08291701 0.25ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 14:20:06 2017
Quant Method : I:\GC10\METHODS\RS082417.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Fri Aug 25 09:19:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

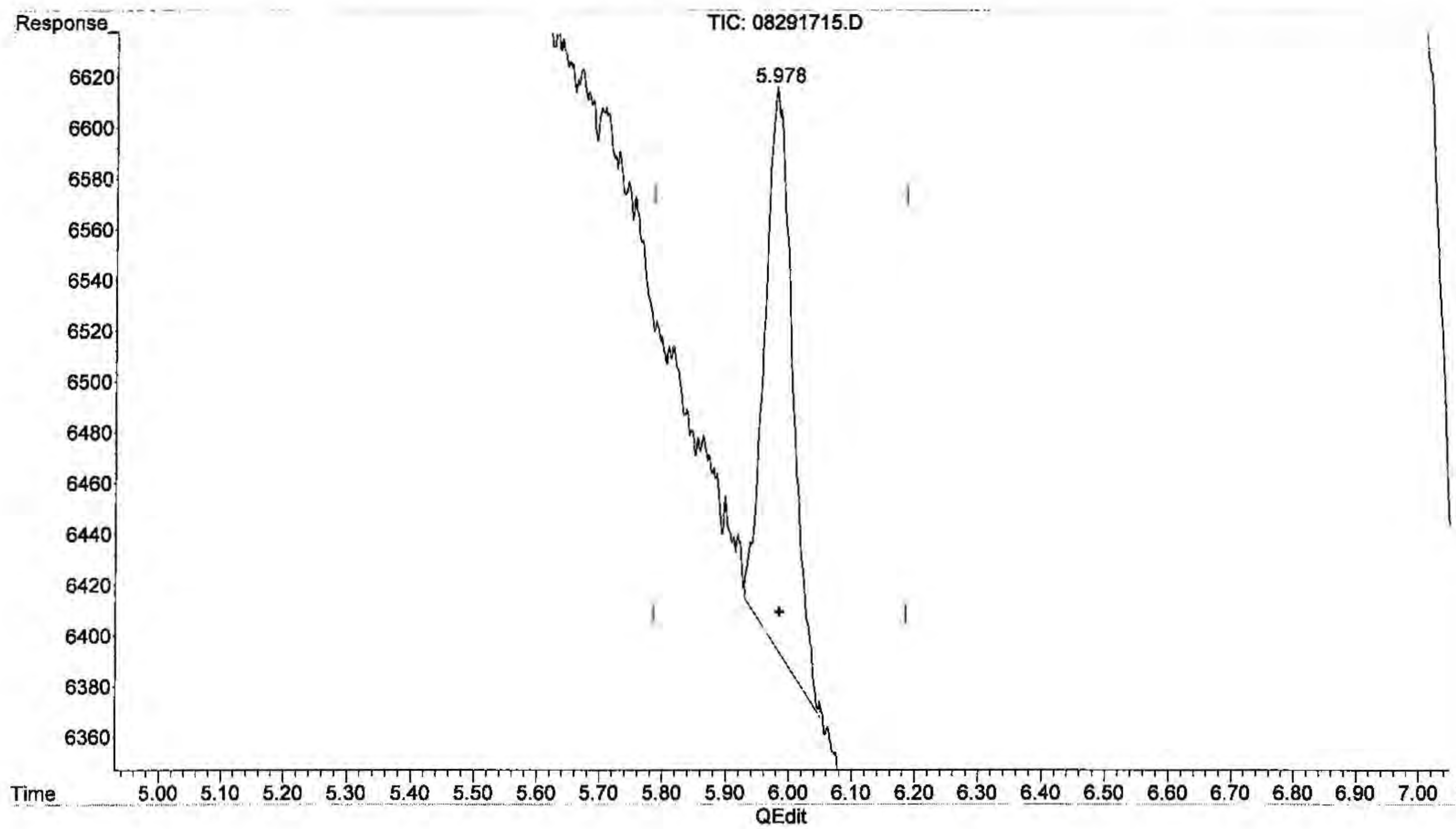




```
Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291715.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 29-Aug-2017, 14:07
Operator  : MC
Sample    : 25ppm s32-08291701 0.25ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 14:20:06 2017
Quant Method : I:\GC10\METHODS\RS082417.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Fri Aug 25 09:19:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase  :                    Signal #2 Phase:
Signal #1 Info   :                    Signal #2 Info :
```



(4) Carbon dioxide

5.978min 27.870 ppm m

response 6794

MC 8/30/17
BW
M
prvw

km 9/4/17

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291716.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 14:22
Operator : MC
Sample : 100ppm s32-08291702 0.2ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 14:51:38 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 14:21:08 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

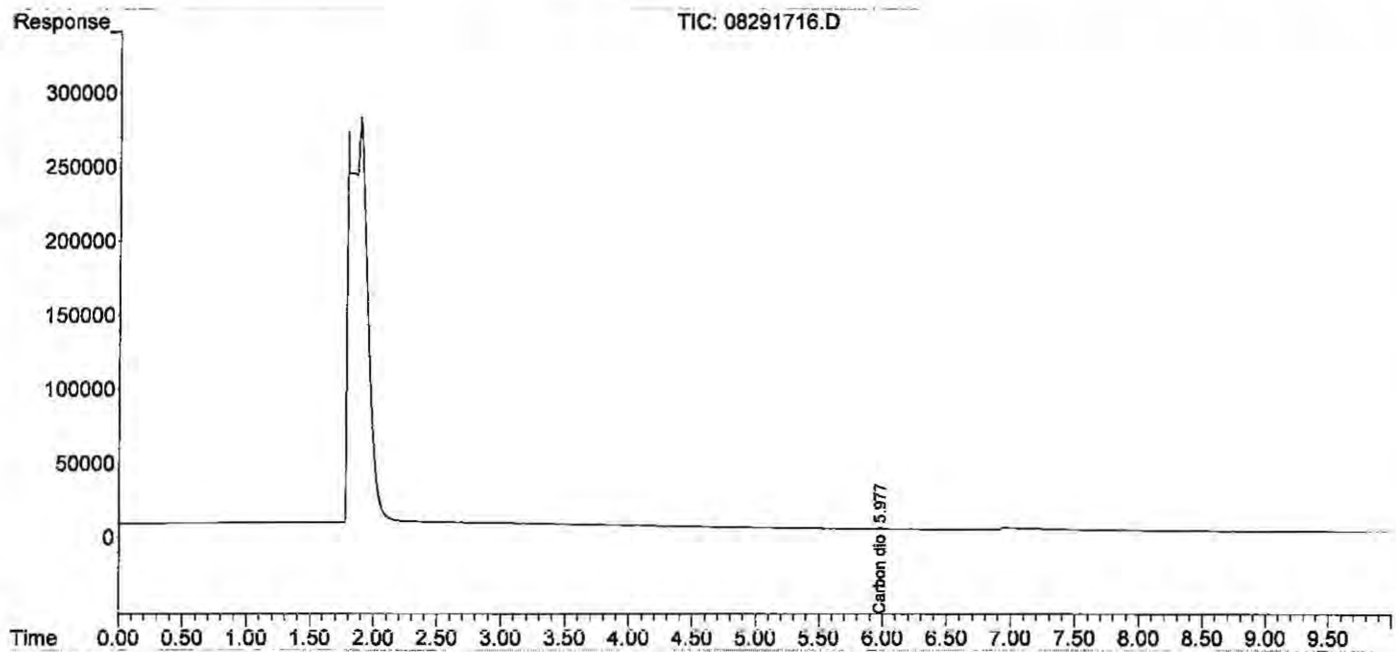
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	1.790	-598962	N.D.	ppm	
2)	Carbon monoxide	0.000	0	N.D.	ppm	d
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	5.978	21932	87.858	ppm	
6)	Methane (FID)	0.000	0	N.D.	ppm	d
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

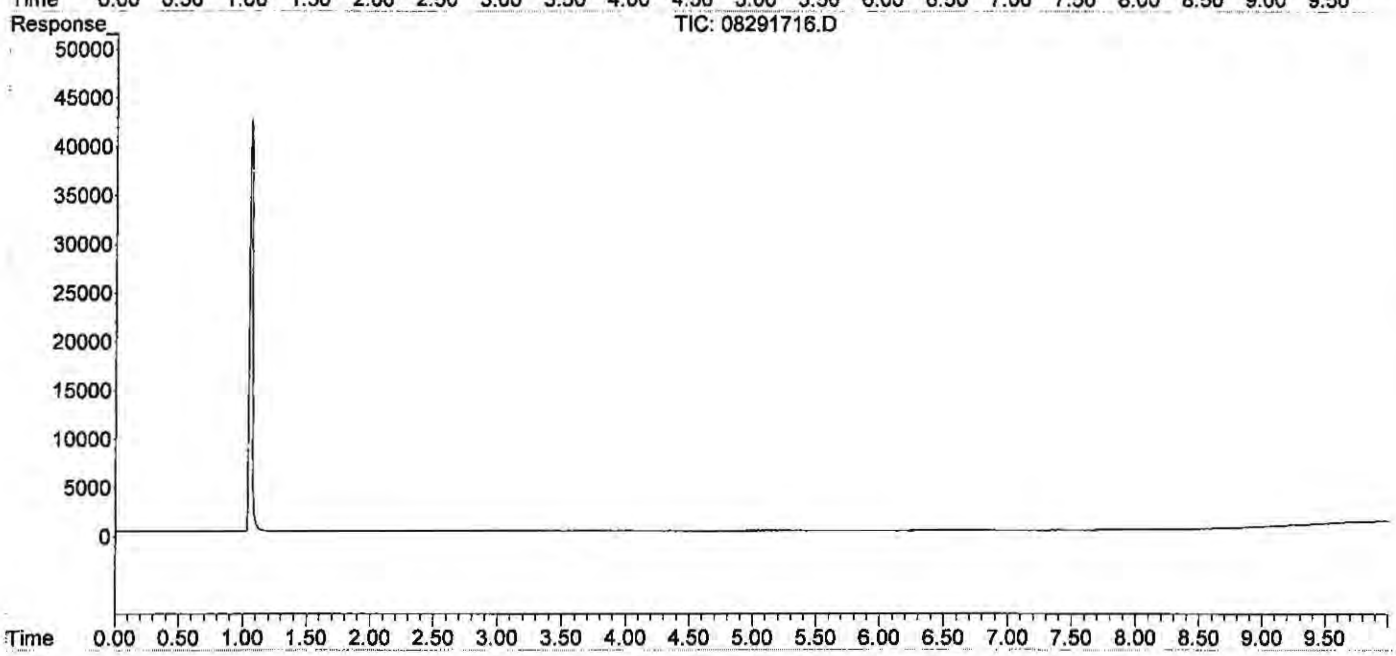
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291716.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 29-Aug-2017, 14:22
Operator  : MC
Sample    : 100ppm s32-08291702 0.2ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 14:51:38 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 14:21:08 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291717.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 14:53
Operator : MC
Sample : 250ppm s32-08291702 0.5ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 15:03:42 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 14:52:06 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

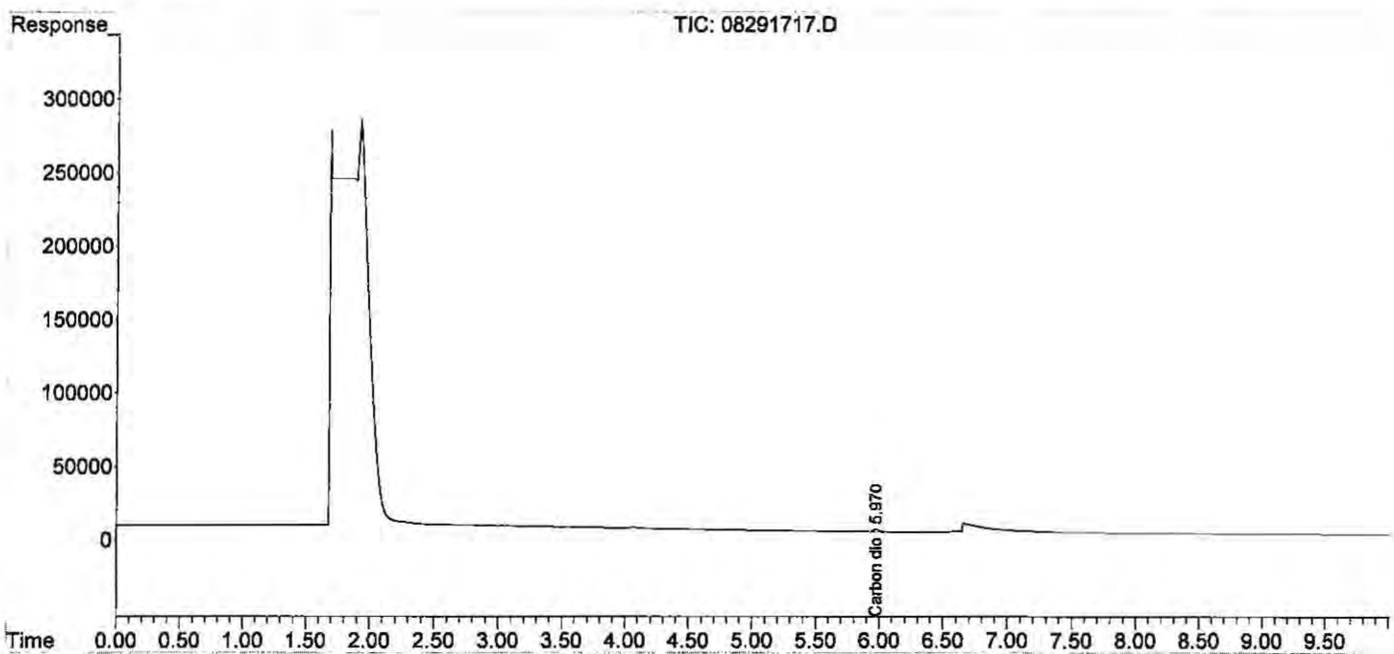
	Compound	R.T.	Response	Conc	Units	
Target	Compounds					
1)	Oxygen/Argon	1.920f	-30716454	N.D.	ppm	
2)	Carbon monoxide	0.000	0	N.D.	ppm	d
3)	Methane (TCD)	0.000	0	N.D.	ppm	d
4)	Carbon dioxide	5.970	58461	240.204	ppm	m
6)	Methane (FID)	0.000	0	N.D.	ppm	d
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

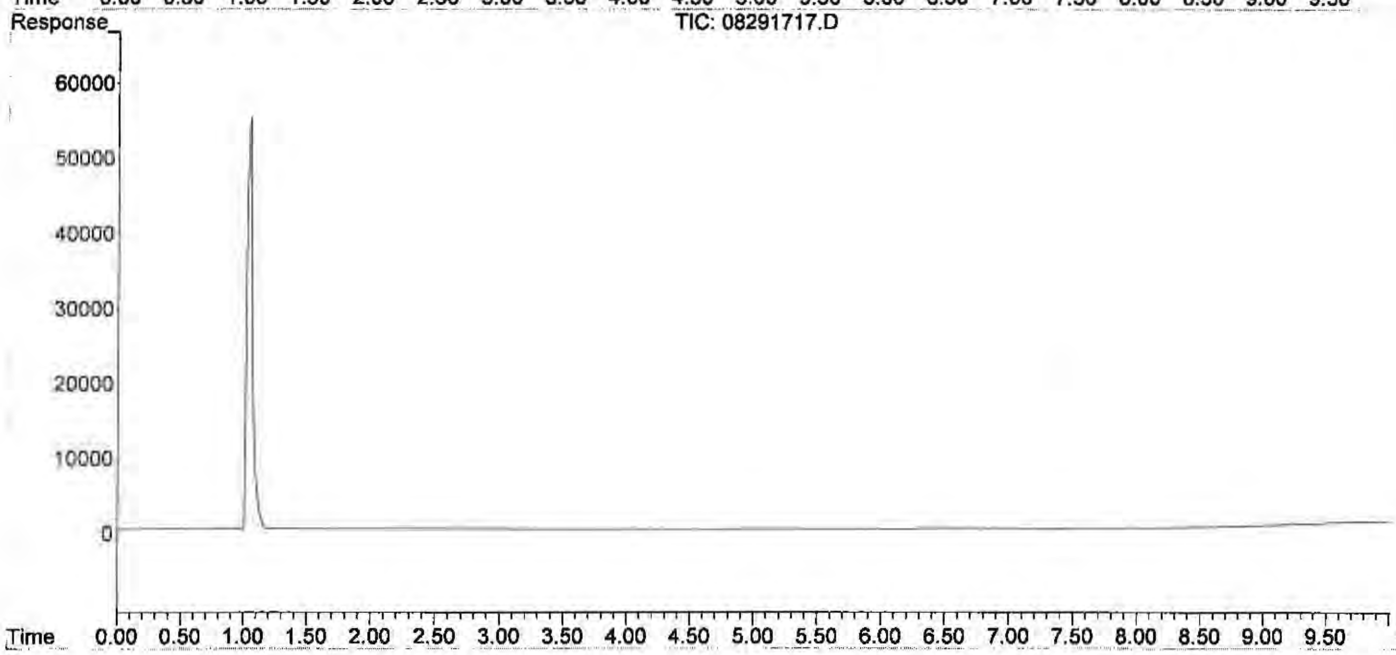
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291717.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 14:53
Operator : MC
Sample : 250ppm s32-08291702 0.5ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 15:03:42 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 14:52:06 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

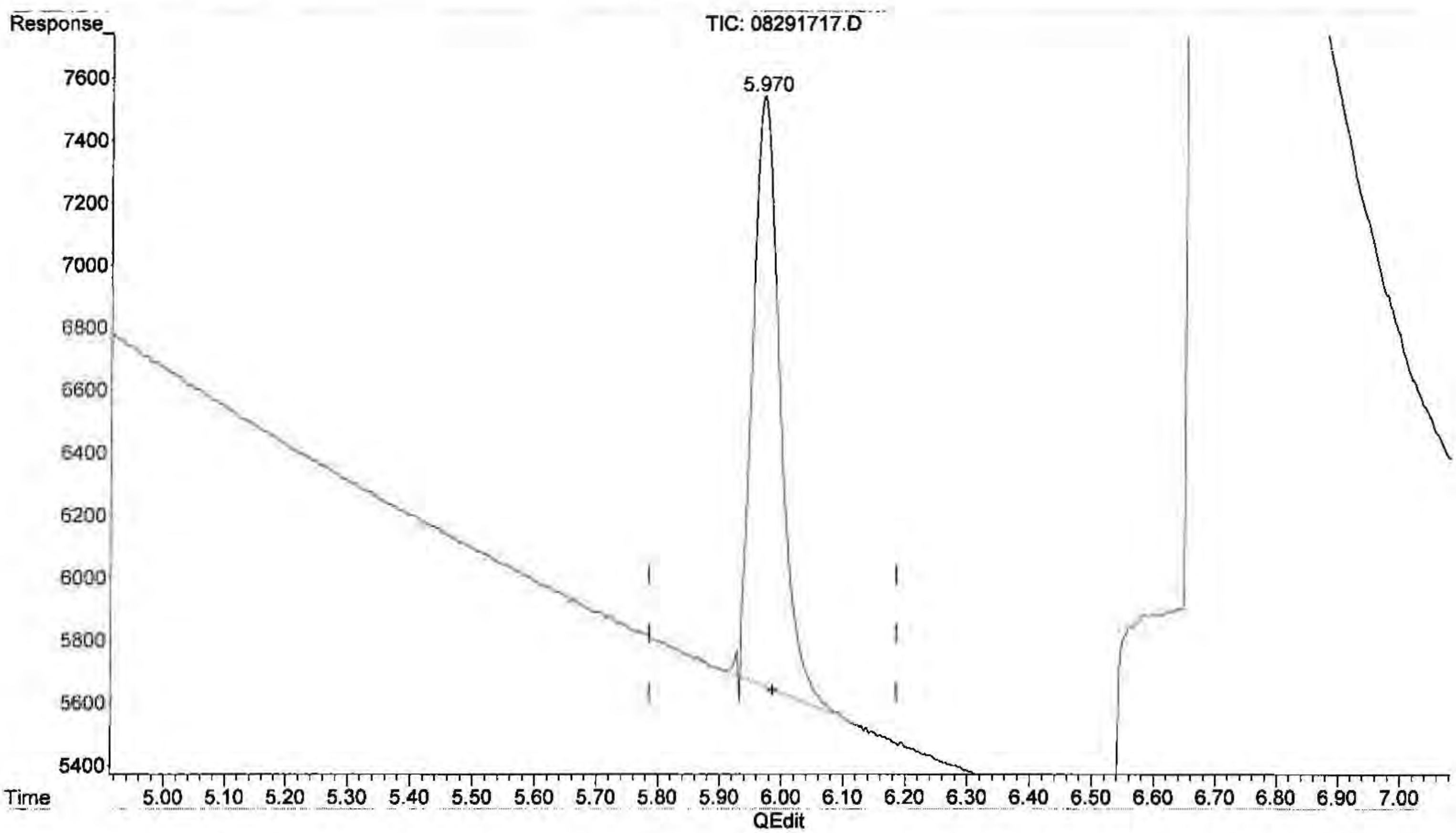




```
Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291717.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 29-Aug-2017, 14:53
Operator  : MC
Sample    : 250ppm s32-08291702 0.5ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 15:03:42 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 14:52:06 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```



(4) Carbon dioxide

5.970min 240.204 ppm m

response 58461

MC 8/11/17

BW

N, [illegible]

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291719.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 15:23
Operator : MC
Sample : 2500ppm s32-08231701 50ul
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 15:35:50 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 15:04:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

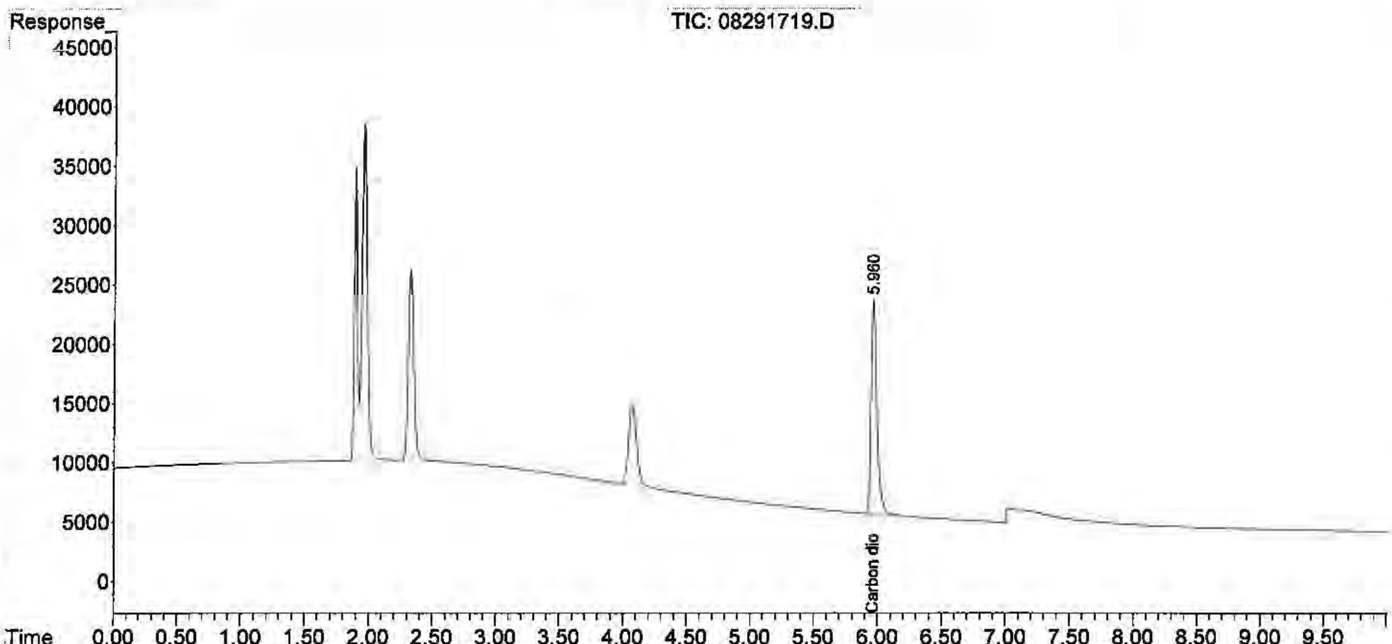
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	0.000	0	N.D.	ppm	d
2)	Carbon monoxide	1.891	425113	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	d
4)	Carbon dioxide	5.962	568043	2369.673	ppm	
6)	Methane (FID)	0.000	0	N.D.	ppm	d
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

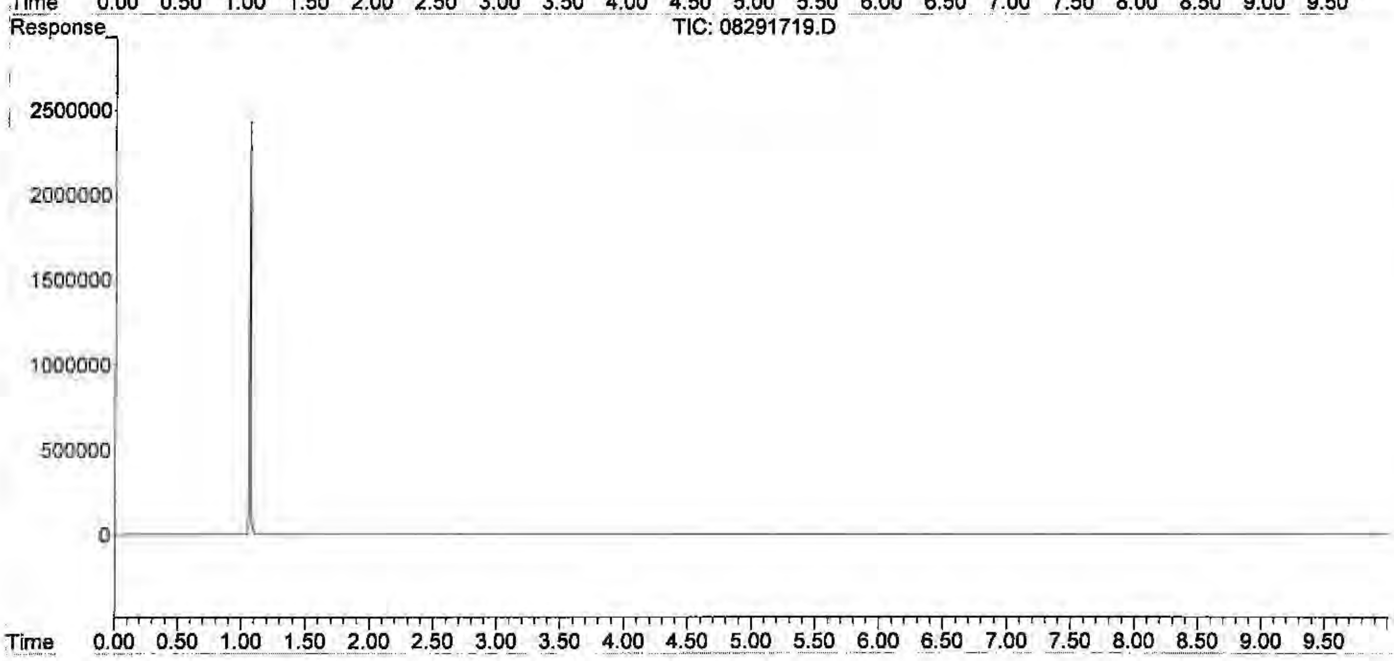
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291719.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 29-Aug-2017, 15:23
Operator  : MC
Sample    : 2500ppm s32-08231701 50ul
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 15:35:50 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 15:04:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase  :                    Signal #2 Phase:
Signal #1 Info   :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291720.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 15:44
Operator : MC
Sample : 5000ppm s32-08231701 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 15:57:17 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 15:36:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

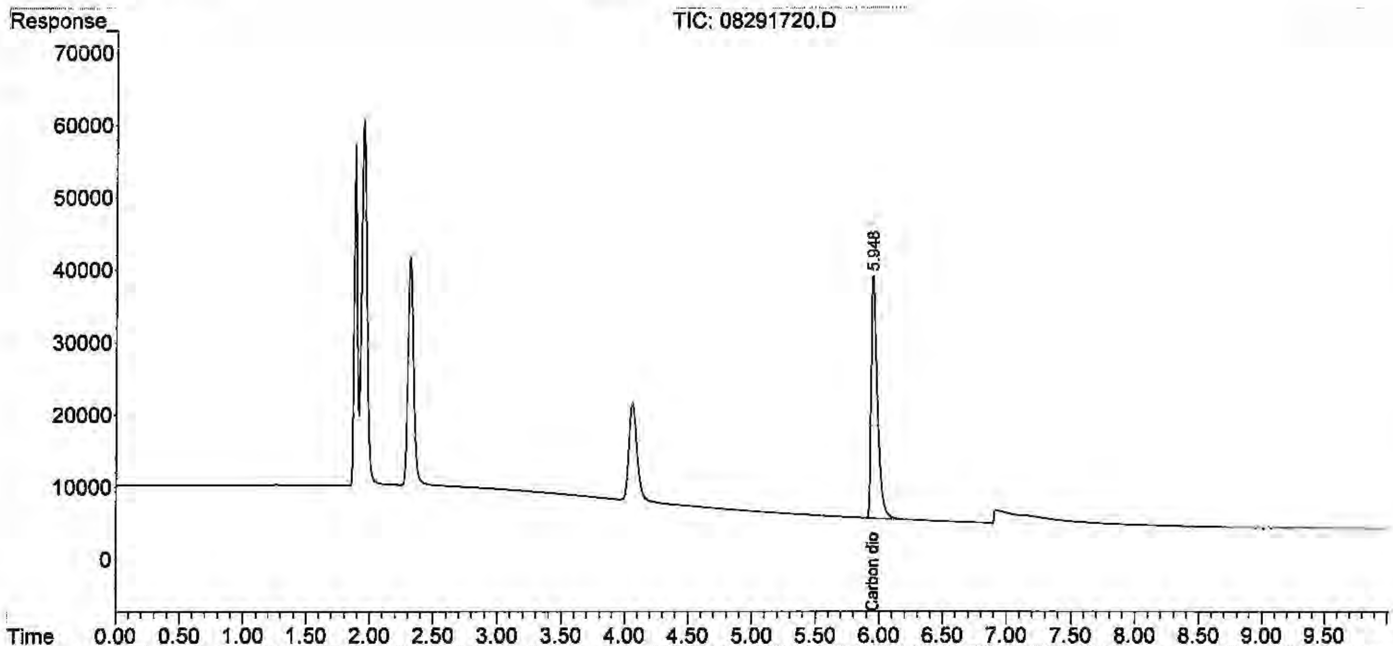
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	0.000	0	N.D.	ppm	d
2)	Carbon monoxide	1.880	819221	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	d
4)	Carbon dioxide	5.948	1132363	4753.126	ppm	
6)	Methane (FID)	0.000	0	N.D.	ppm	d
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

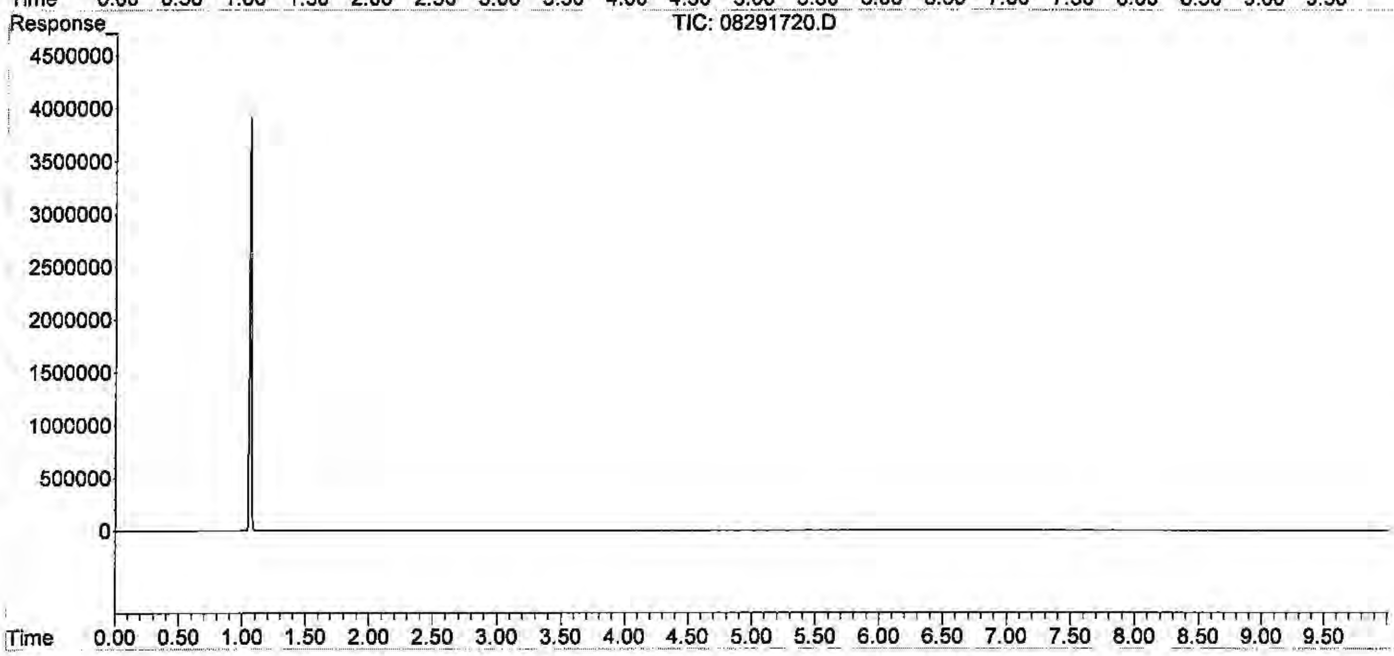
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291720.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 15:44
Operator : MC
Sample : 5000ppm s32-08231701 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 15:57:17 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 15:36:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291721.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 16:00
Operator : MC
Sample : 25000ppm s32-08231701 0.5ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 16:12:53 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 15:57:37 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

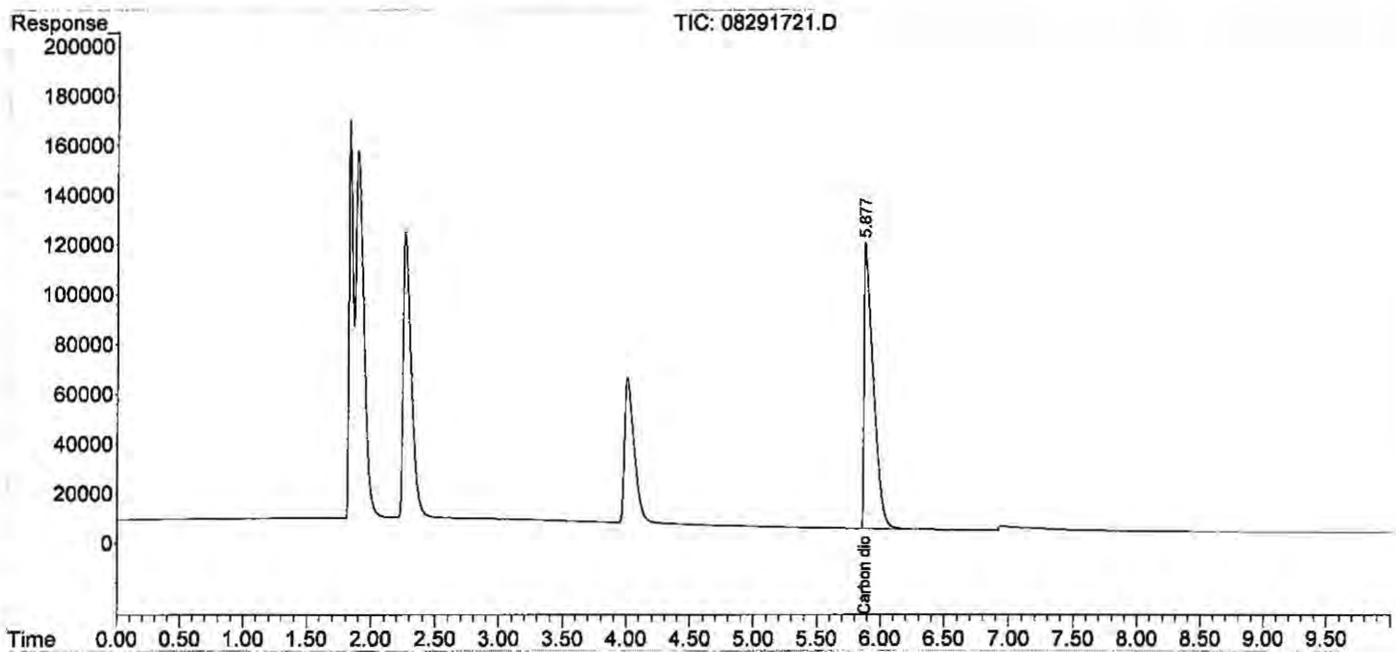
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	0.000	0	N.D.	ppm	d
2)	Carbon monoxide	1.827	3325463	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	d
4)	Carbon dioxide	5.879f	5744295	24443.288	ppm	
6)	Methane (FID)	0.000	0	N.D.	ppm	d
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

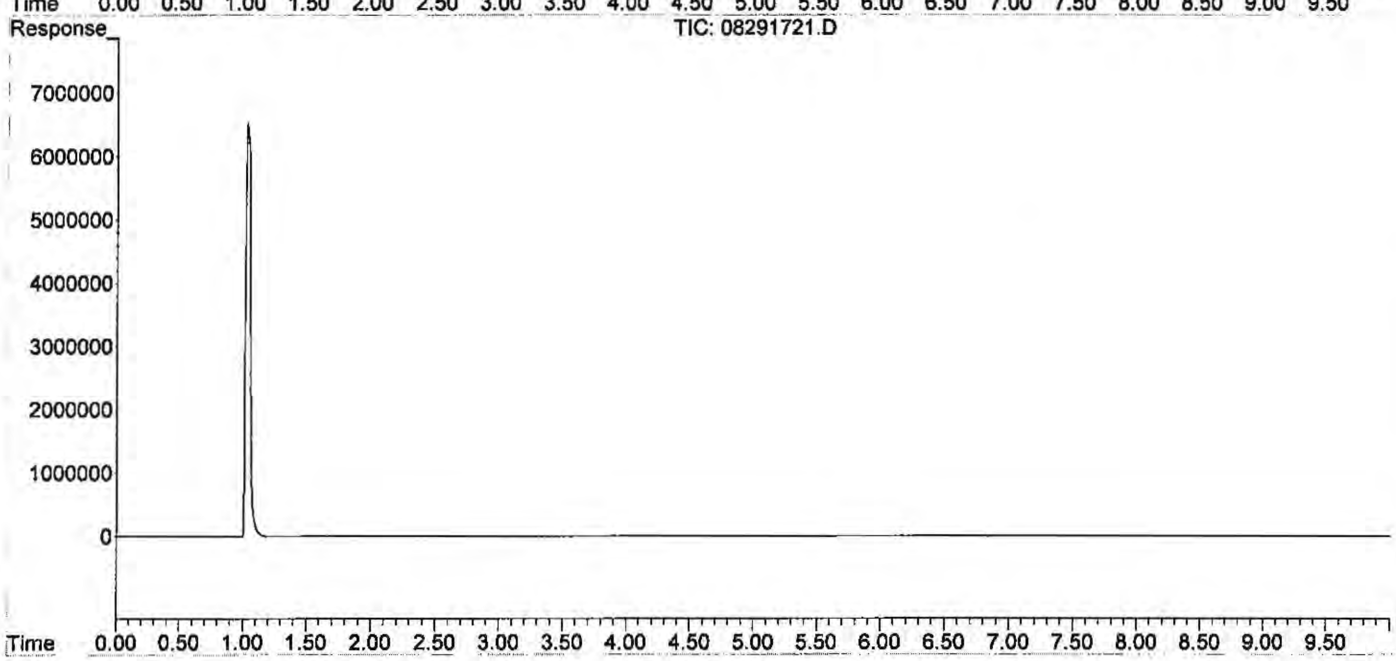
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291721.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 16:00
Operator : MC
Sample : 25000ppm s32-08231701 0.5ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 16:12:53 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 15:57:37 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291723.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 16:35
Operator : MC
Sample : icv s30-07071701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 16:54:07 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

	Compound	R.T.	Response	Conc	Units		
	Target Compounds						
1)	Oxygen/Argon	1.886	536422	0.113	ppm	actual	%D
2)	Carbon monoxide	1.886	536422	N.D.	ppm		
3)	Methane (TCD)	4.059f	626500	66244.710	ppm		
4)	Carbon dioxide	5.947	1163775	4957.948	ppm	5000	99.16
6)	Methane (FID)	1.062	37290742	3947.023	ppm		
7)	Ethylene	0.000	0	N.D.	ppm		
8)	Ethane	0.000	0	N.D.	ppm		
9)	Propylene	0.000	0	N.D.	ppm		
10)	Propane	0.000	0	N.D.	ppm		
11)	Isobutylene	0.000	0	N.D.	ppm		
12)	Isobutane	0.000	0	N.D.	ppm		
13)	n-Butane	0.000	0	N.D.	ppm		

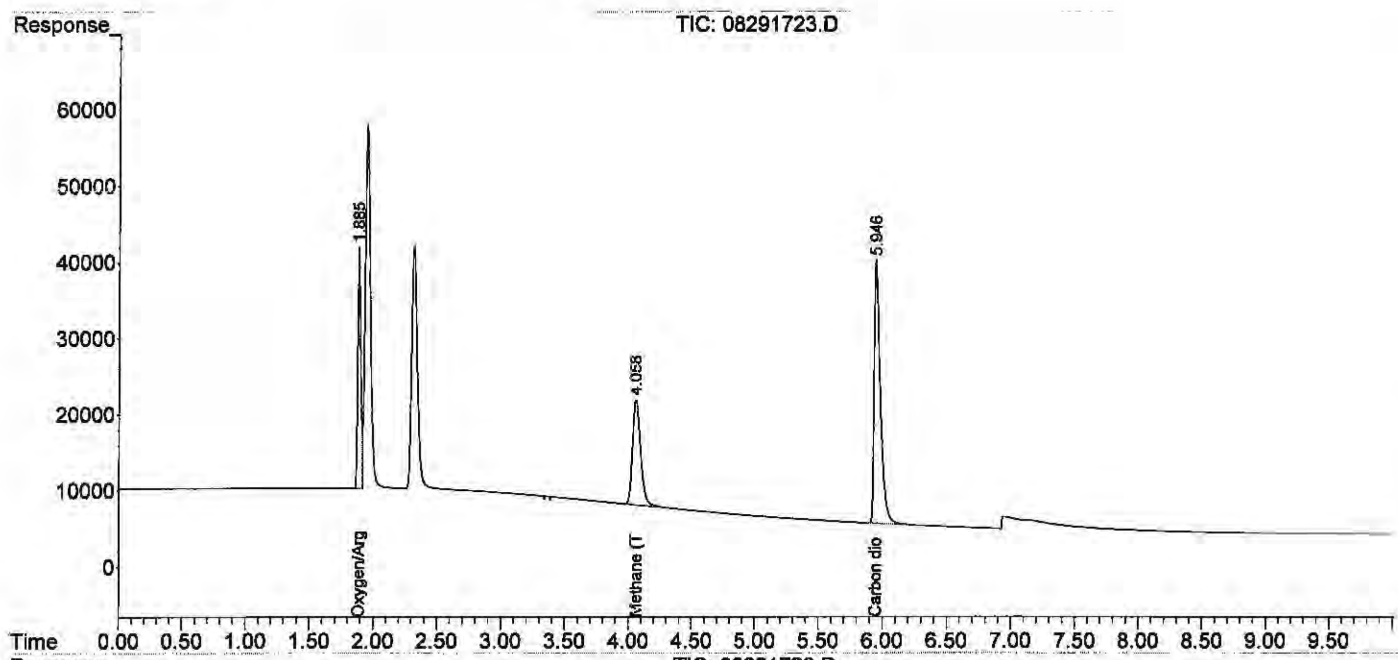
(f)=RT Delta > 1/2 Window (m)=manual int.

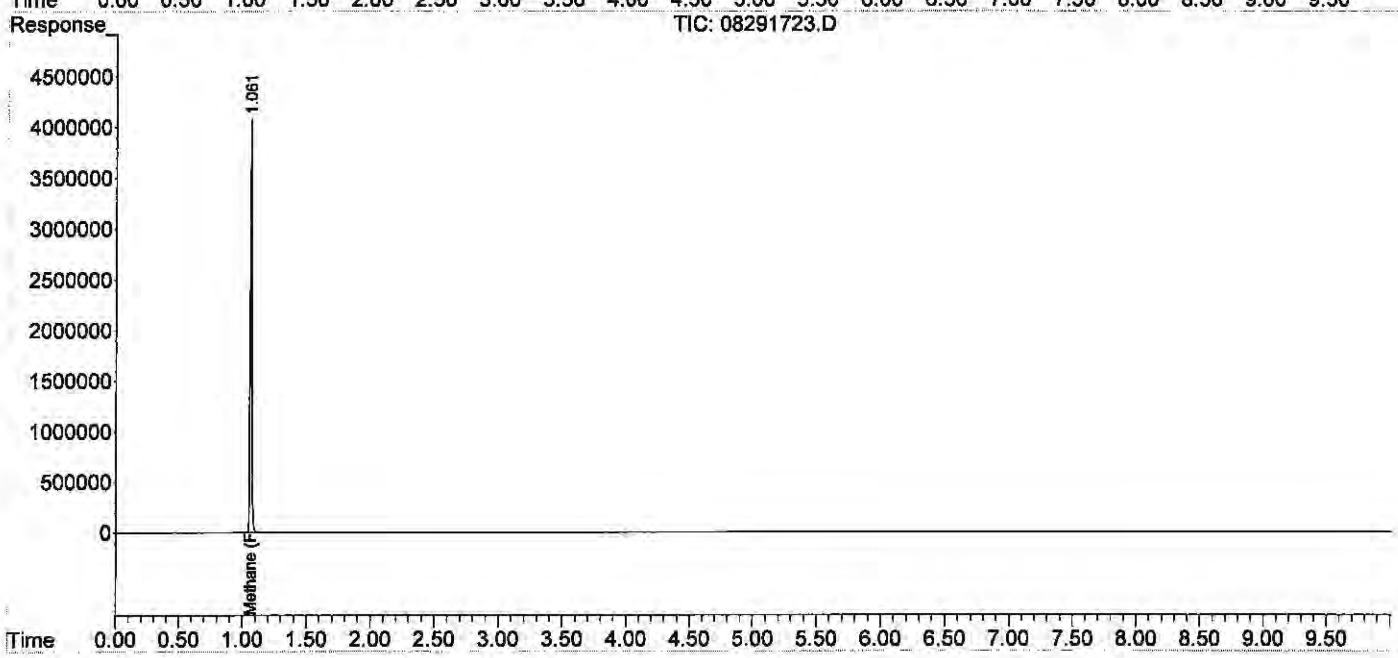
W 9/4/17

Data Path : J:\GC10\DATA\RSK_FID\2017_08\29\
Data File : 08291723.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 29-Aug-2017, 16:35
Operator : MC
Sample : icv s30-07071701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Aug 29 16:54:07 2017
Quant Method : I:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





ALS Environmental

Method : RSK175 Headspace Method for Dissolved Hydrocarbon in Water by FID/TCD
Client : ALS Laboratory Group
Service Request: P1902518
Sample Vol. (ml) : 32.00 ml

Analyst : WH
Date Analysis : 05/13/19
Head Space Vol.(ml) : 8.00 ml

Instrument : GC#10
Detector : FID#10, TCD#10
Gas Constant : 24.05684 (20°C)

Sample ID	Inj. Vol.	HEAD SPACE RESULT (ppm) Carbon Dioxide		FINAL HEAD SPACE RESULT (ppm) Carbon Dioxide
std s32-04251903	0.100	4880.961	**WWt.**	44.10
ACTUAL		5000.00	**HENRY'S CONSTANT**	1.42E+03
%Difference		2.4%	**RL**	100.00
mcs 0.1ml	0.100	0.000	mcs 0.1ml	0.000
rb 0.1ml	0.100	0.000		
lcs tcd 0.1ml	0.100	882.856	lcs tcd 0.1ml	8828.560
lcsd tcd 0.1ml	0.100	924.812	lcsd tcd 0.1ml	9248.120
P1902518-001 50ul	0.050	19195.37	P1902518-001 50ul	383907.30
P1902518-002 50ul	0.050	19720.18	P1902518-002 50ul	394403.68
P1902518-003 50ul	0.050	6255.744	P1902518-003 50ul	125114.88

std s32-04251903	4596.279
ACTUAL	5000.00
%Difference	8.1%

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131901.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 10:39:51
Operator : WH
Sample : std s32-04251903
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 10:52:50 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

WH 5/14/19

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

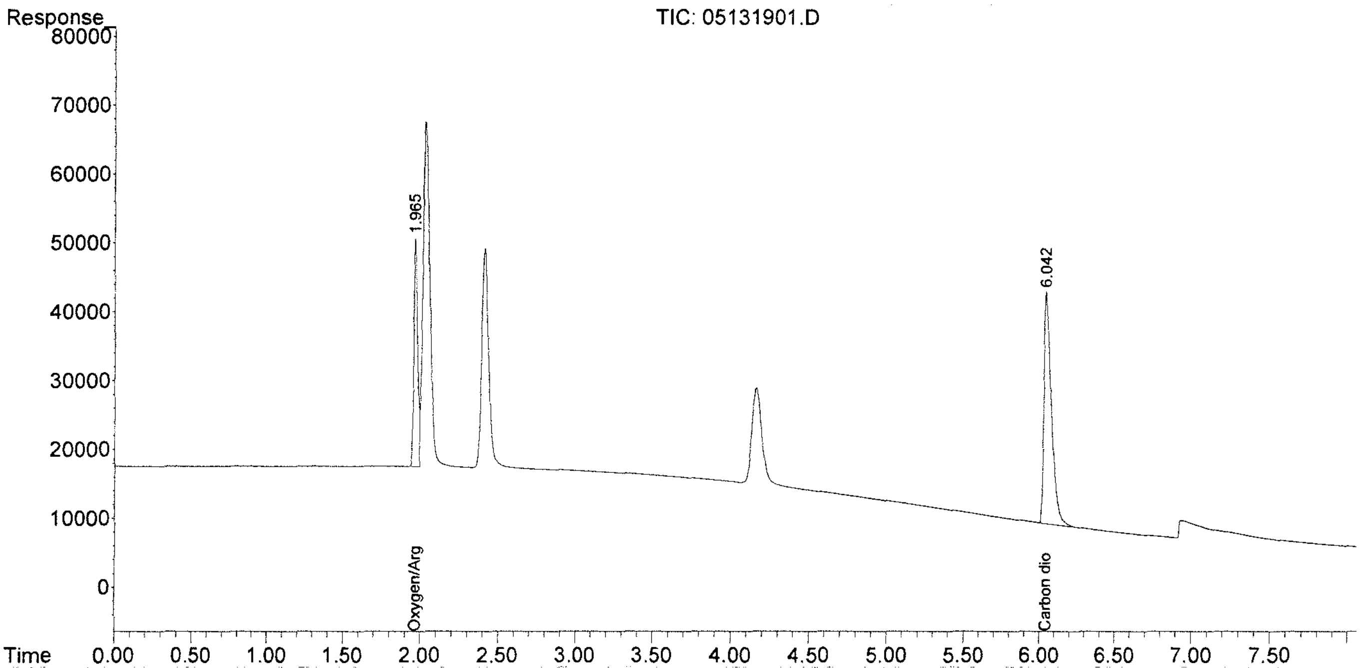
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	1.965f	585039	0.123	ppm	
2)	Carbon monoxide	1.965f	585039	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	6.042	1145704	4880.961	ppm	m
6)	Methane (FID)	0.000	0	N.D.	ppm	
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

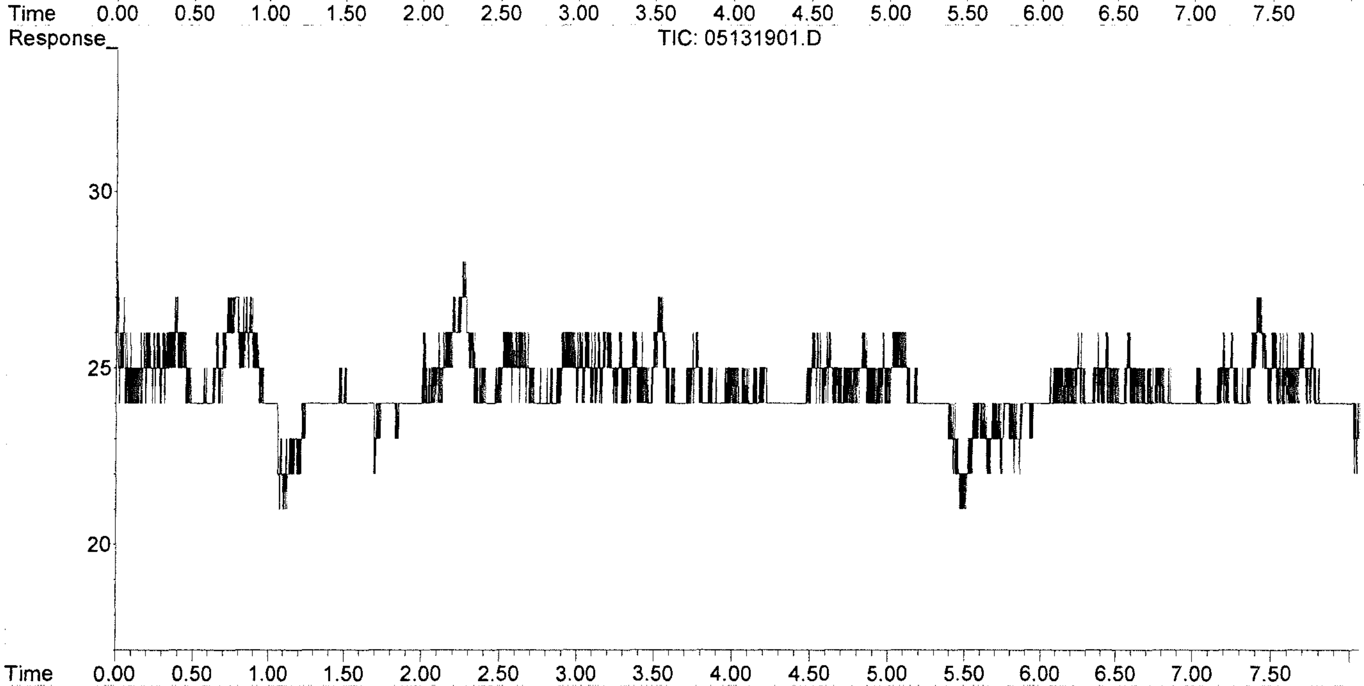
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131901.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 13-May-2019, 10:39:51
Operator  : WH
Sample    : std s32-04251903
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 10:52:50 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase :                Signal #2 Phase:
Signal #1 Info  :                Signal #2 Info :
```

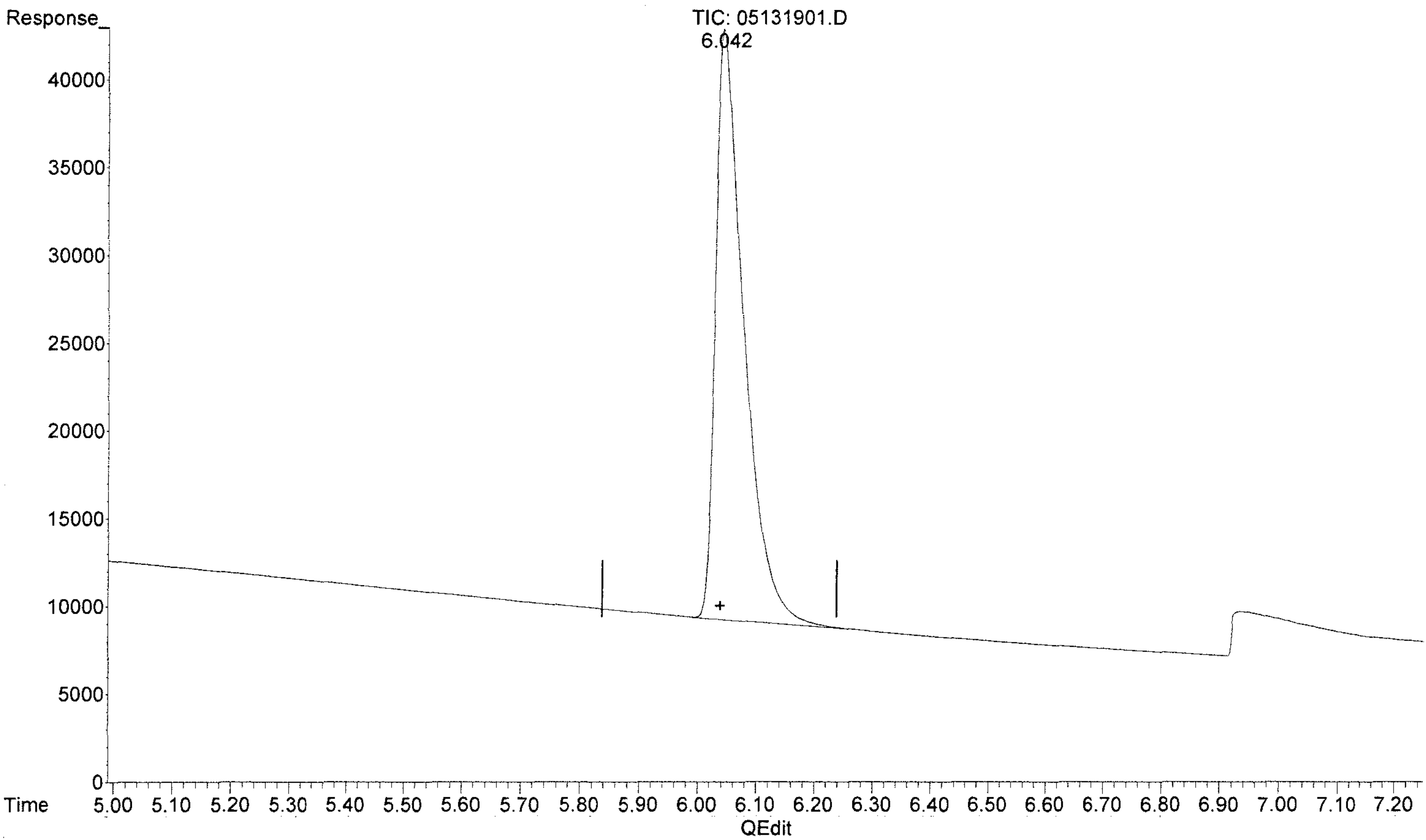




Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131901.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 10:39:51
Operator : WH
Sample : std s32-04251903
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 10:52:50 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide

6.042min 4880.961 ppm m

response 1145704

MR 5/14/19

Lw 5/14/19 BL no previous

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131915.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 14:32:20
Operator : WH
Sample : std s32-04251903
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 14:41:16 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

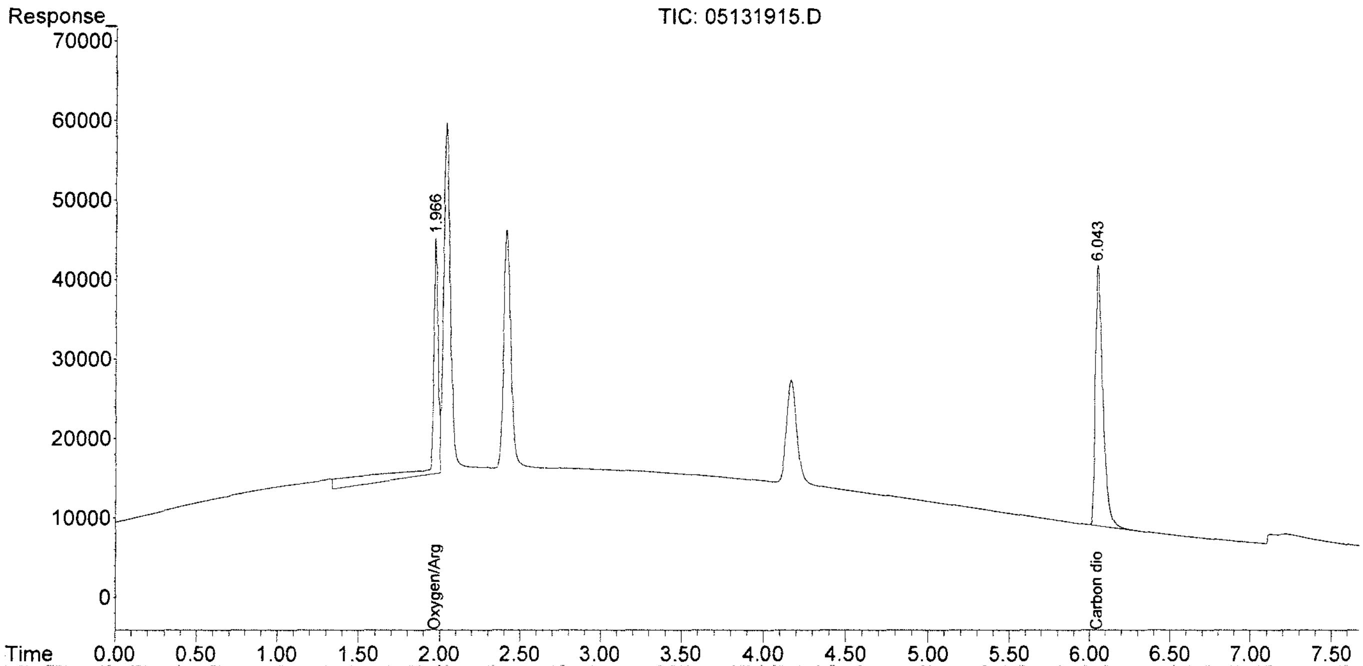
	Compound	R.T.	Response	Conc	Units
	Target Compounds				
1)	Oxygen/Argon	1.967f	853084	0.179	ppm
2)	Carbon monoxide	1.967f	853084	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	6.044	1078881	4596.279	ppm
6)	Methane (FID)	0.000	0	N.D.	ppm
7)	Ethylene	0.000	0	N.D.	ppm
8)	Ethane	0.000	0	N.D.	ppm
9)	Propylene	0.000	0	N.D.	ppm
10)	Propane	0.000	0	N.D.	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

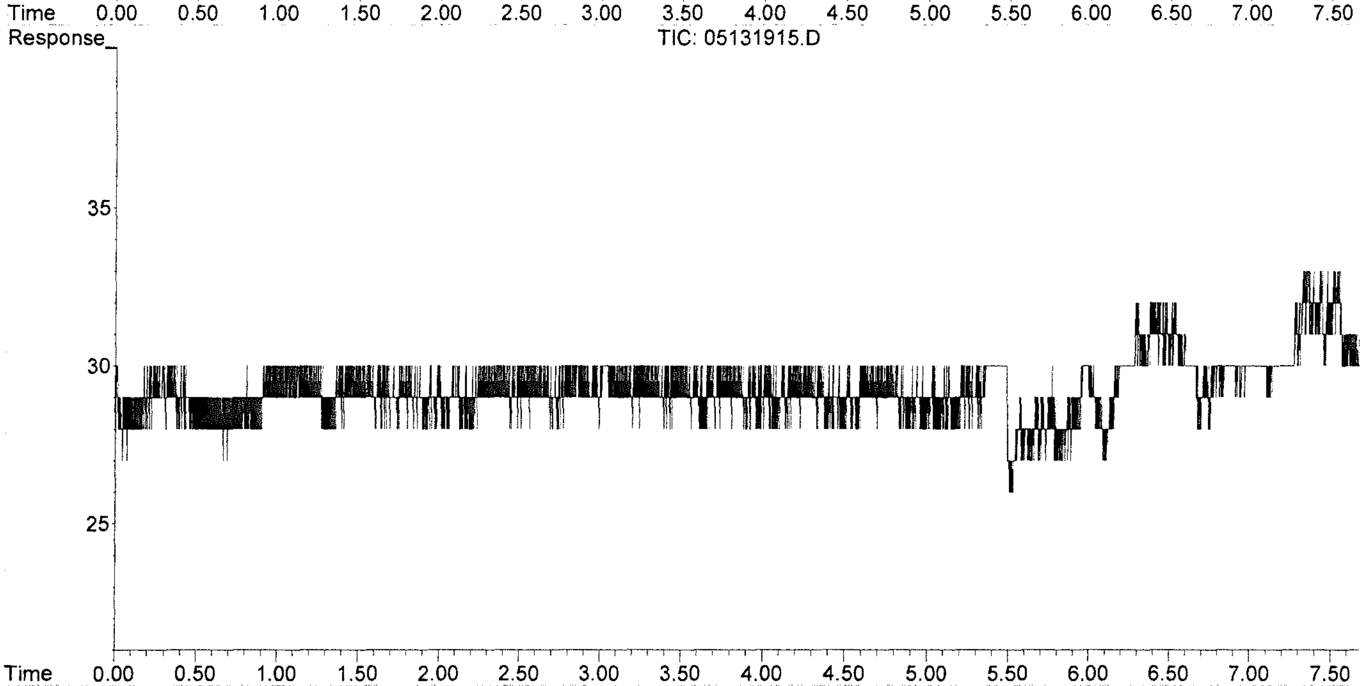
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2019_05\13\
Data File : 05131915.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 13-May-2019, 14:32:20
Operator : WH
Sample : std s32-04251903
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 13 14:41:16 2019
Quant Method : J:\GC10\METHODS\RS082817_CO2.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Tue Aug 29 16:13:13 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





Injection Log

Directory: I:\GC10\DATA\RSK_FID\2017_08\29\

	Date/Time	File Name	Sample ID	Misc Info	Operator	Acquisition Method	Comments
1	29-Aug-17, 07:58:00	08291701.D	std s30-06161601		MC	RSKBOTH.M	Pass
2	29-Aug-17, 08:11:02	08291702.D	mb 0.5ml		MC	RSKBOTH.M	Pass
3	29-Aug-17, 08:24:13	08291703.D	4089-001 0.5ml		MC	RSKBOTH.M	
4	29-Aug-17, 08:39:29	08291704.D	4089-002 0.5ml		MC	RSKBOTH.M	
5	29-Aug-17, 08:53:38	08291705.D	4089-003 0.5ml		MC	RSKBOTH.M	
6	29-Aug-17, 09:33:52	08291706.D	4089-004 0.5ml		MC	RSKBOTH.M	
7	29-Aug-17, 09:50:51	08291707.D	4089-005 0.5ml		MC	RSKBOTH.M	
8	29-Aug-17, 10:07:54	08291708.D	4089-006 0.5ml		MC	RSKBOTH.M	
9	29-Aug-17, 10:42:34	08291709.D	4089-007 0.5ml		MC	RSKBOTH.M	
10	29-Aug-17, 11:06:01	08291710.D	4089-008 0.5ml		MC	RSKBOTH.M	
11	29-Aug-17, 11:23:53	08291711.D	4089-009 0.5ml		MC	RSKBOTH.M	
12	29-Aug-17, 11:37:17	08291712.D	lcs s30-05241604		MC	RSKBOTH.M	Pass
13	29-Aug-17, 11:50:31	08291713.D	lcs s30-05241604		MC	RSKBOTH.M	Pass
14	29-Aug-17, 12:29:45	08291714.D	std s30-06161601		MC	RSKBOTH.M	Pass
15	29-Aug-17, 14:07:01	08291715.D	25ppm s32-08291701 0.25ml		MC	RSKBOTH.M	Curve
16	29-Aug-17, 14:22:12	08291716.D	100ppm s32-08291702 0.2ml		MC	RSKBOTH.M	Curve
17	29-Aug-17, 14:53:00	08291717.D	250ppm s32-08291702 0.5ml		MC	RSKBOTH.M	Curve
18	29-Aug-17, 15:07:43	08291718.D	mis inject		MC	RSKBOTH.M	
19	29-Aug-17, 15:23:21	08291719.D	2500ppm s32-08231701 50ul		MC	RSKBOTH.M	Curve
20	29-Aug-17, 15:44:54	08291720.D	5000ppm s32-08231701 0.1ml		MC	RSKBOTH.M	Curve
21	29-Aug-17, 16:00:09	08291721.D	25000ppm s32-08231701 0.5ml		MC	RSKBOTH.M	Curve
22	29-Aug-17, 16:15:43	08291722.D	mb 0.1ml		MC	RSKBOTH.M	Pass
23	29-Aug-17, 16:35:37	08291723.D	icv s30-07071701		MC	RSKBOTH.M	Pass

Injection Log

Directory: I:\GC10\DATA\RSK_TCD\2019_05\13\

	Date/Time	File Name	Sample ID	Misc Info	Operator	Acquisition Method	Comments
1	13-May-19, 10:39:51	05131901.D	std s32-04251903		WH	RSKBOTH.M	pass
2	13-May-19, 10:55:14	05131902.D	rb 0.1ml		WH	RSKBOTH.M	pass
3	13-May-19, 11:08:12	05131903.D	mcs 0.1ml		WH	RSKBOTH.M	pass
4	13-May-19, 11:26:21	05131904.D	lcs tcd 0.1ml		WH	RSKBOTH.M	pass
5	13-May-19, 11:41:14	05131905.D	lcsd tcd 0.1ml		WH	RSKBOTH.M	pass
6	13-May-19, 12:02:10	05131906.D	P1902518-001 0.1		WH	RSKBOTH.M	
7	13-May-19, 12:13:16	05131907.D	P1902518-001 50ul		WH	RSKBOTH.M	
8	13-May-19, 12:26:26	05131908.D	P1902518-002 50ul		WH	RSKBOTH.M	
9	13-May-19, 12:36:10	05131909.D	P1902518-003 50ul		WH	RSKBOTH.M	
10	13-May-19, 12:47:39	05131910.D	P1902501-001 0.1ml		WH	RSKBOTH.M	
11	13-May-19, 13:03:32	05131911.D	P1902701-001 50ul		WH	RSKBOTH.M	
12	13-May-19, 13:33:30	05131912.D	P1902701-002 50ul		WH	RSKBOTH.M	
13	13-May-19, 14:04:20	05131913.D	P1902701-003 50ul		WH	RSKBOTH.M	
14	13-May-19, 14:19:29	05131914.D	P1902701-004 50u		WH	RSKBOTH.M	
15	13-May-19, 14:32:20	05131915.D	std s32-04251903		WH	RSKBOTH.M	pass
16	13-May-19, 14:42:38	05131916.D	P1902701-005 50ul		WH	RSKBOTH.M	
17	13-May-19, 15:04:14	05131917.D	P1902701-006 50ul		WH	RSKBOTH.M	
18	13-May-19, 15:17:18	05131918.D	P1902700-001 50ul		WH	RSKBOTH.M	
19	13-May-19, 15:28:07	05131919.D	P1902700-002 50ul		WH	RSKBOTH.M	
20	13-May-19, 15:48:03	05131920.D	P1902700-002ms 50ul		WH	RSKBOTH.M	
21	13-May-19, 15:58:06	05131921.D	P1902700-002msd 50ul		WH	RSKBOTH.M	
22	13-May-19, 16:11:51	05131922.D	std s32-04251903		WH	RSKBOTH.M	pass

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071911.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 15:22:32
Operator : WH
Sample : P1902518-001 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:54 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

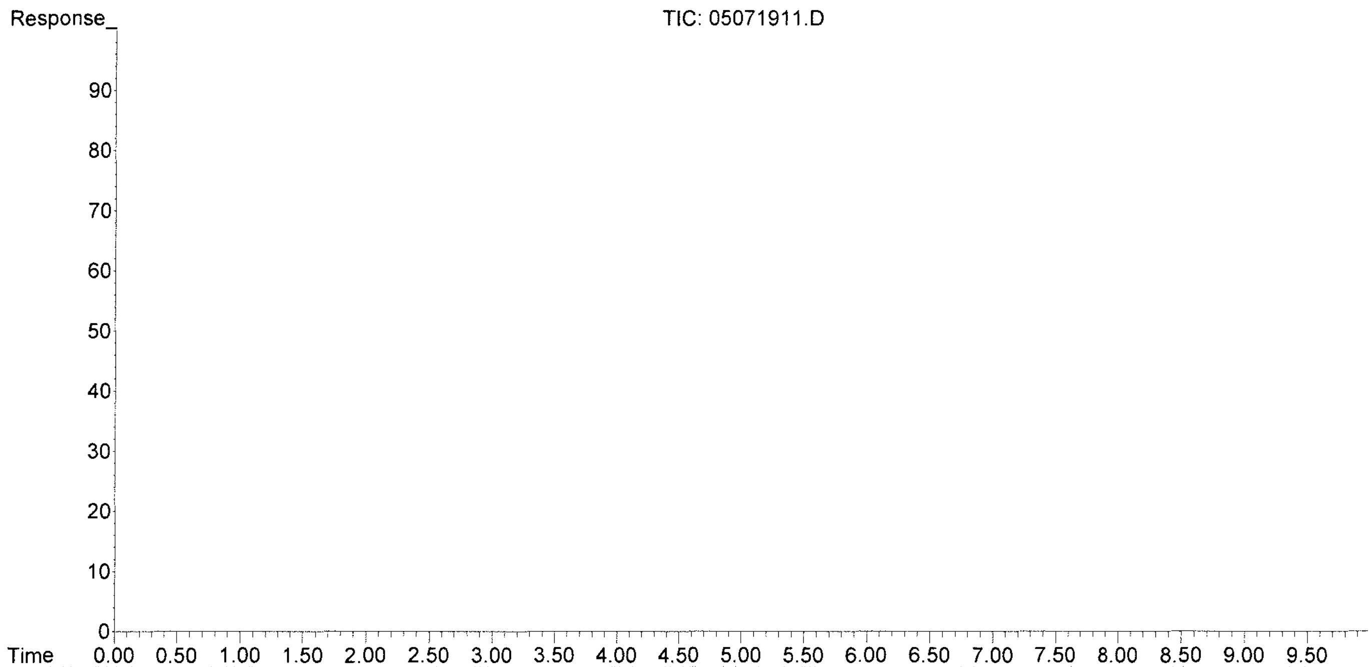
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	0.000	0	N.D.	ppm	
2)	Carbon monoxide	0.000	0	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	0.000	0	N.D.	ppm	
6)	Methane (FID)	1.115	646	0.071	ppm	m
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

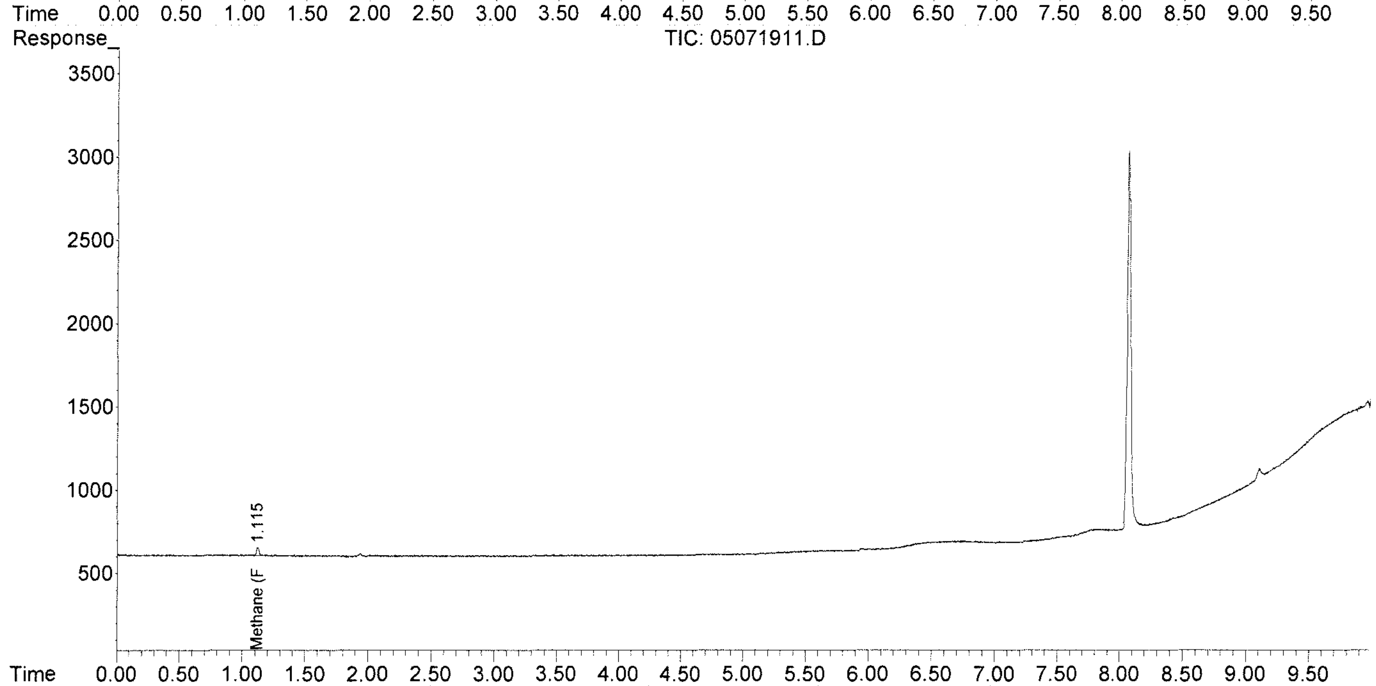
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071911.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 15:22:32
Operator  : WH
Sample    : P1902518-001 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:54 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```

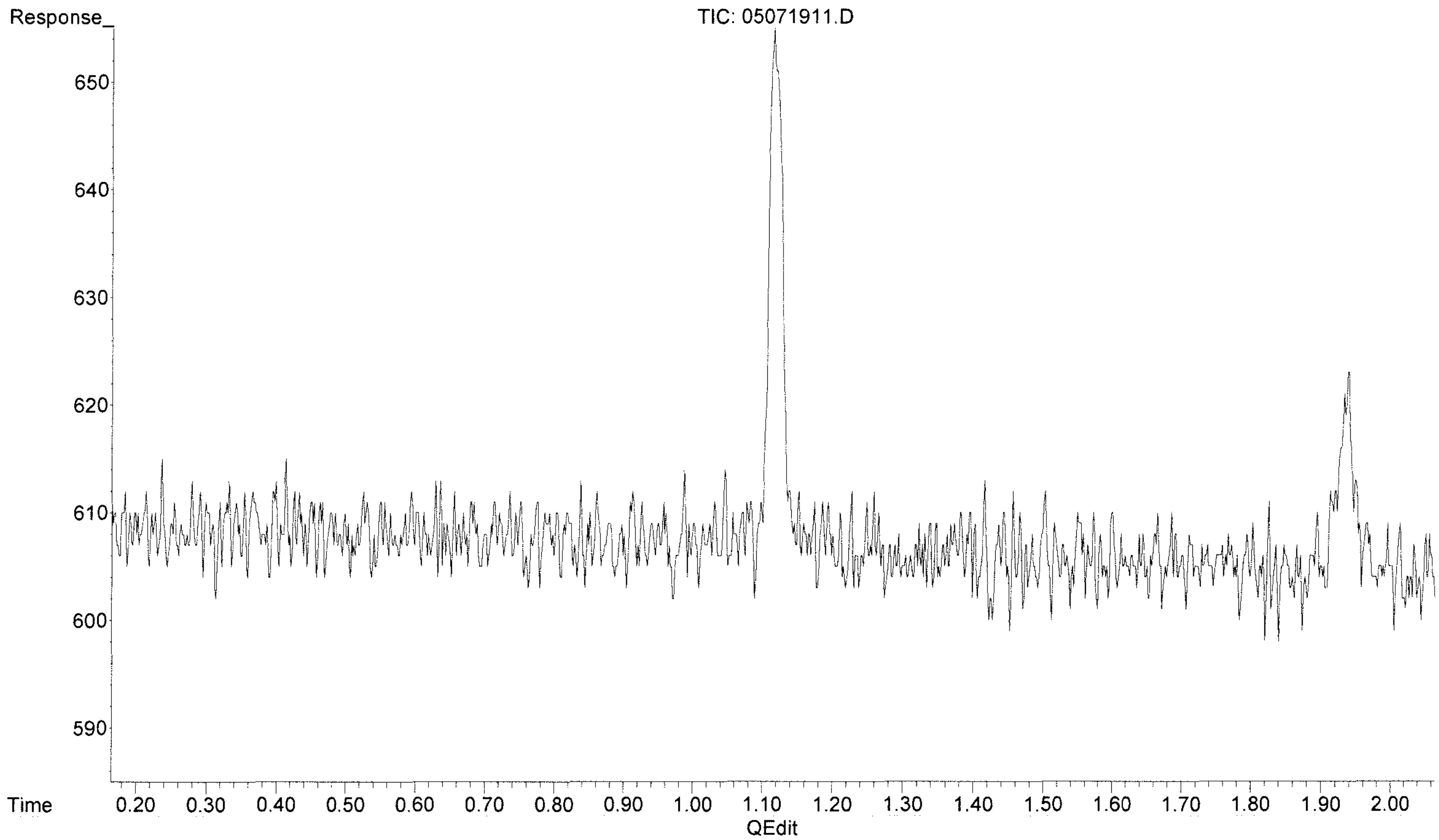




```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071911.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 15:22:32
Operator  : WH
Sample    : P1902518-001 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:54 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase :                  Signal #2 Phase:
Signal #1 Info  :                  Signal #2 Info :
```



(6) Methane (FID)

1.115min 0.000 ppm

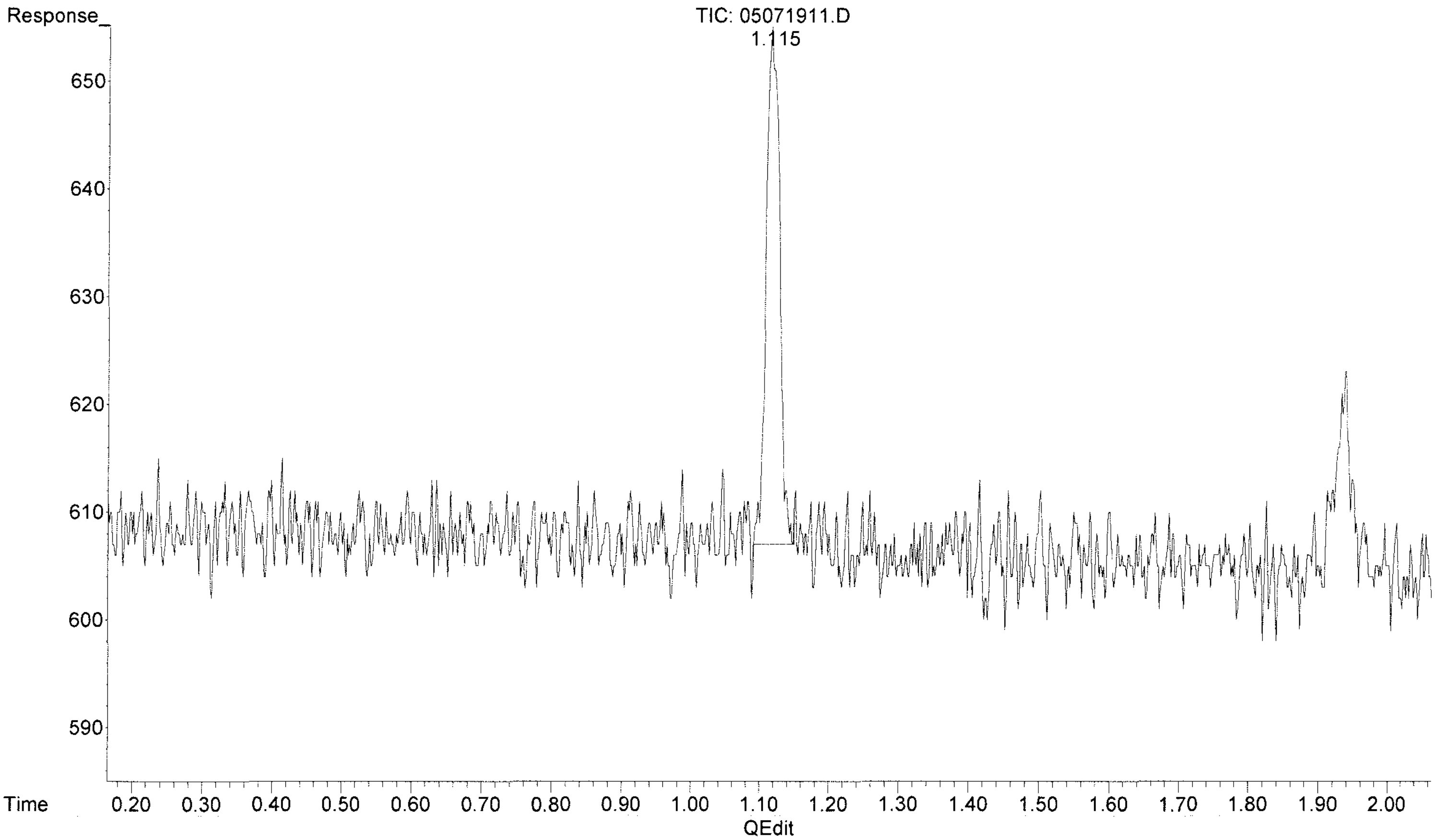
response 0

(+) = Expected Retention Time

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071911.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 15:22:32
Operator  : WH
Sample    : P1902518-001 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:54 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```



(6) Methane (FID)

1.115min 0.071 ppm m

response 646

MR
5/13/19

WS 5/11/19
MP

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071912.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 15:42:23
Operator : WH
Sample : P1902518-002 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:58 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

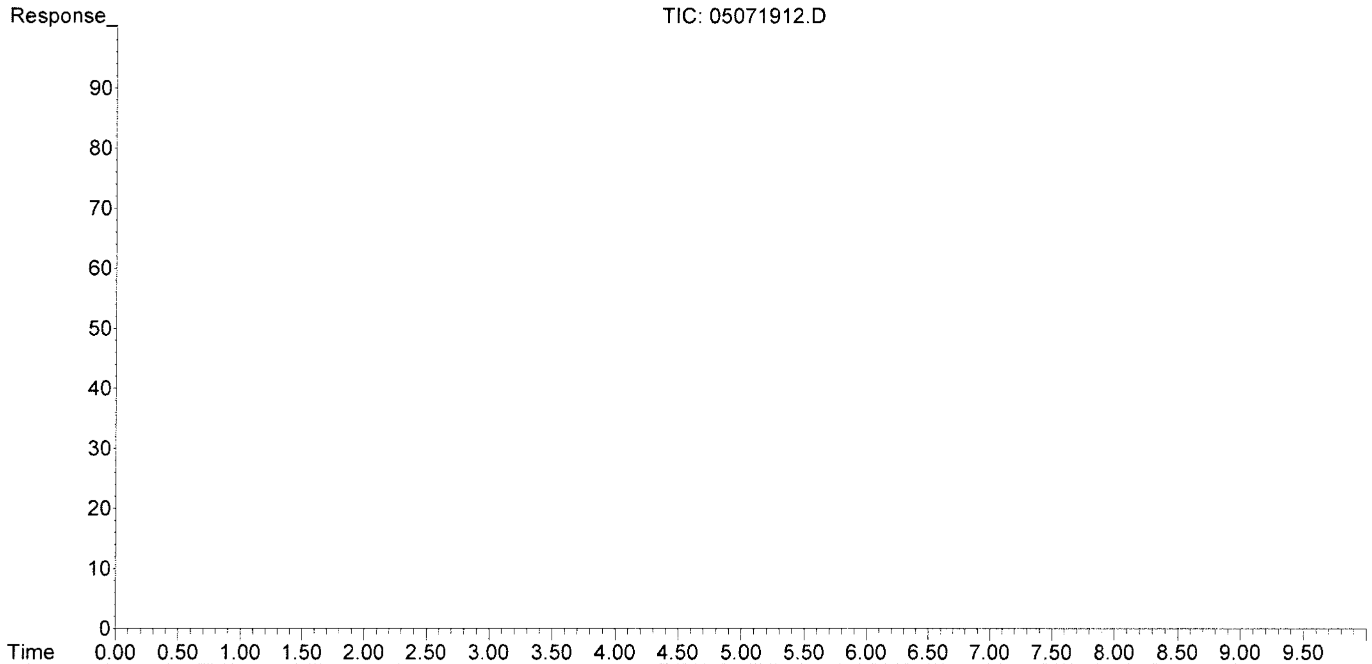
	Compound	R.T.	Response	Conc	Units	
	Target Compounds					
1)	Oxygen/Argon	0.000	0	N.D.	ppm	
2)	Carbon monoxide	0.000	0	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	0.000	0	N.D.	ppm	
6)	Methane (FID)	1.113	599	0.066	ppm	m
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

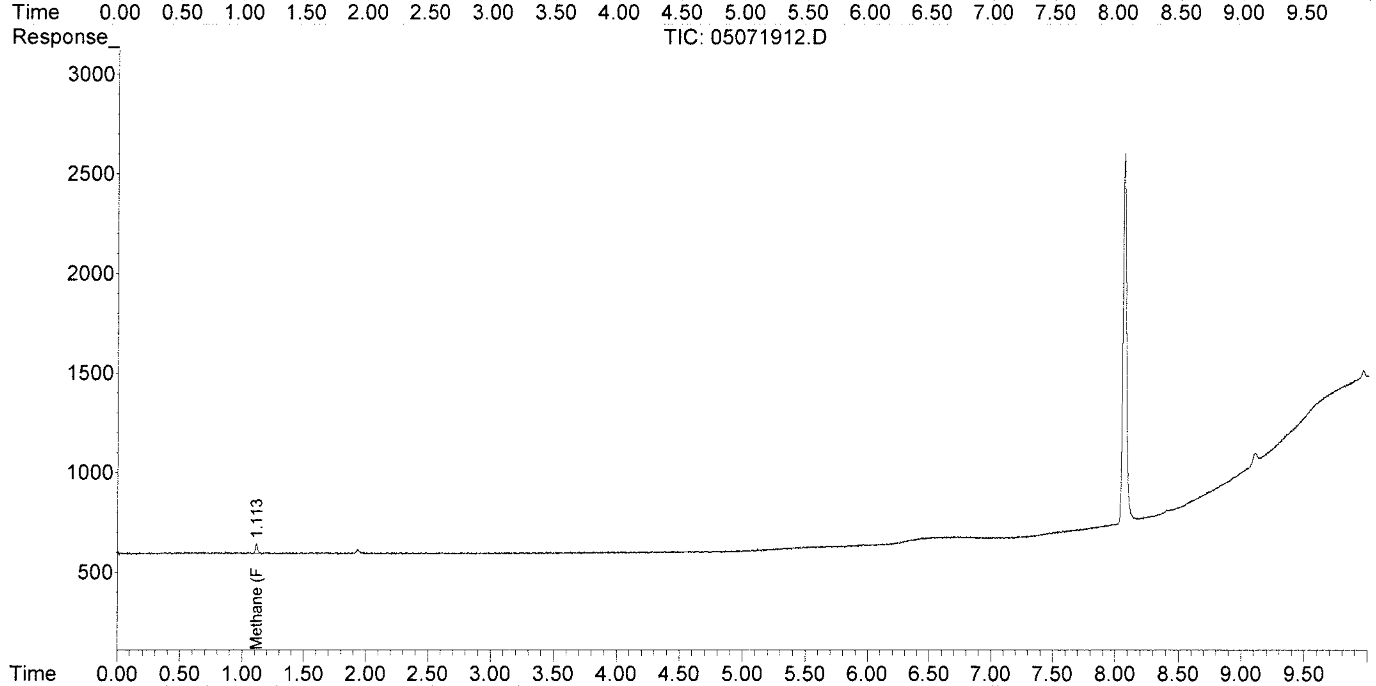
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071912.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 15:42:23
Operator : WH
Sample : P1902518-002 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:58 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



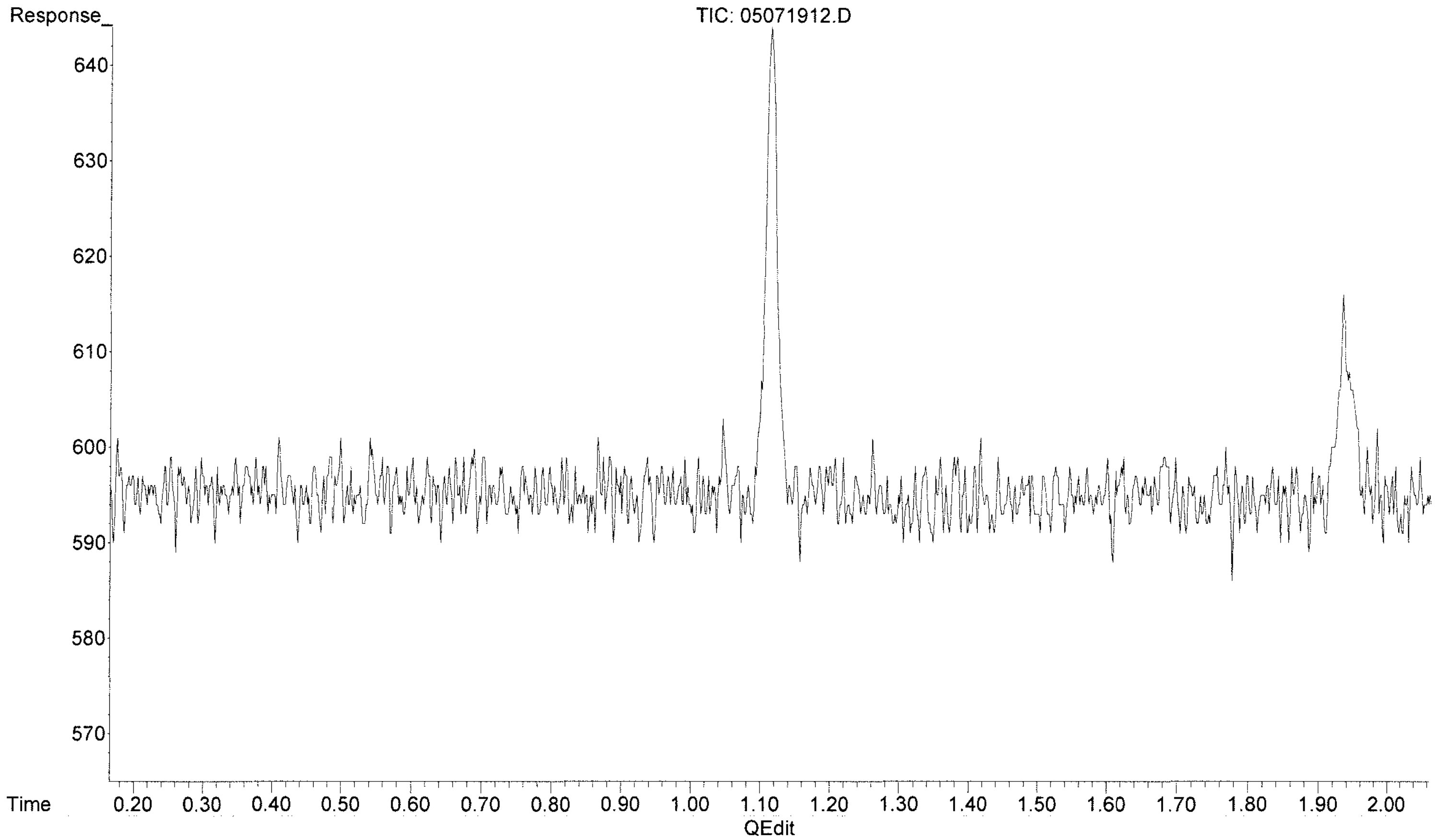


00954896

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071912.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 15:42:23
Operator : WH
Sample : P1902518-002 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:58 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

1.115min 0.000 ppm

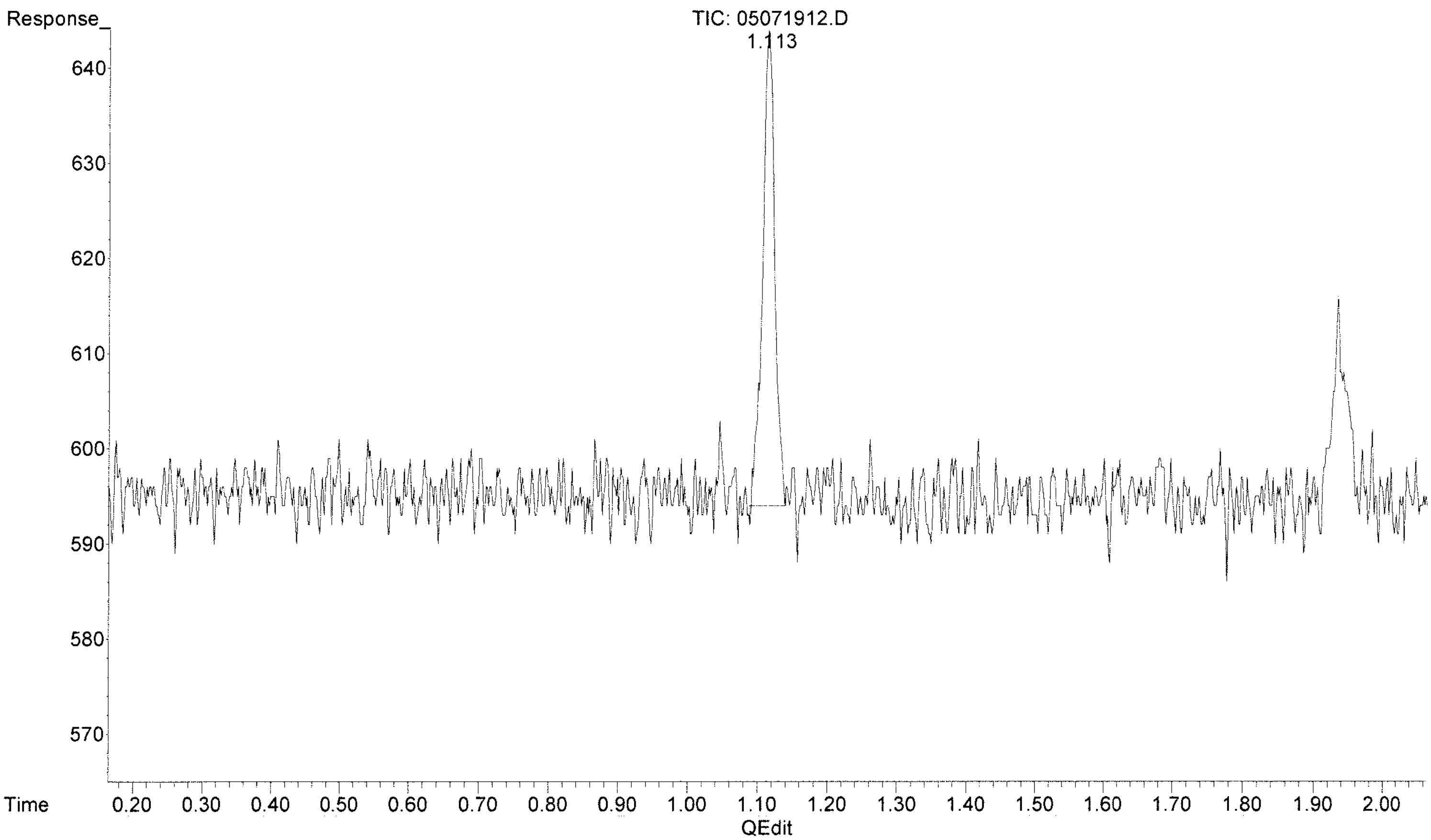
response 0

(+) = Expected Retention Time

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071912.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 15:42:23
Operator  : WH
Sample    : P1902518-002 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:08:58 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.       :
Signal #1 Phase   :                    Signal #2 Phase:
Signal #1 Info    :                    Signal #2 Info  :
```



(6) Methane (FID)

1.113min 0.066 ppm m

response 599

MR 5/13/19

lm 5/11/19 ms

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071913.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 15:55:45
Operator : WH
Sample : P1902518-003 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:09:02 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	0.000	0	N.D.	ppm
2)	Carbon monoxide	0.000	0	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.112	12044	1.328	ppm
7)	Ethylene	0.000	0	N.D.	ppm
8)	Ethane	0.000	0	N.D.	ppm
9)	Propylene	0.000	0	N.D.	ppm
10)	Propane	0.000	0	N.D.	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

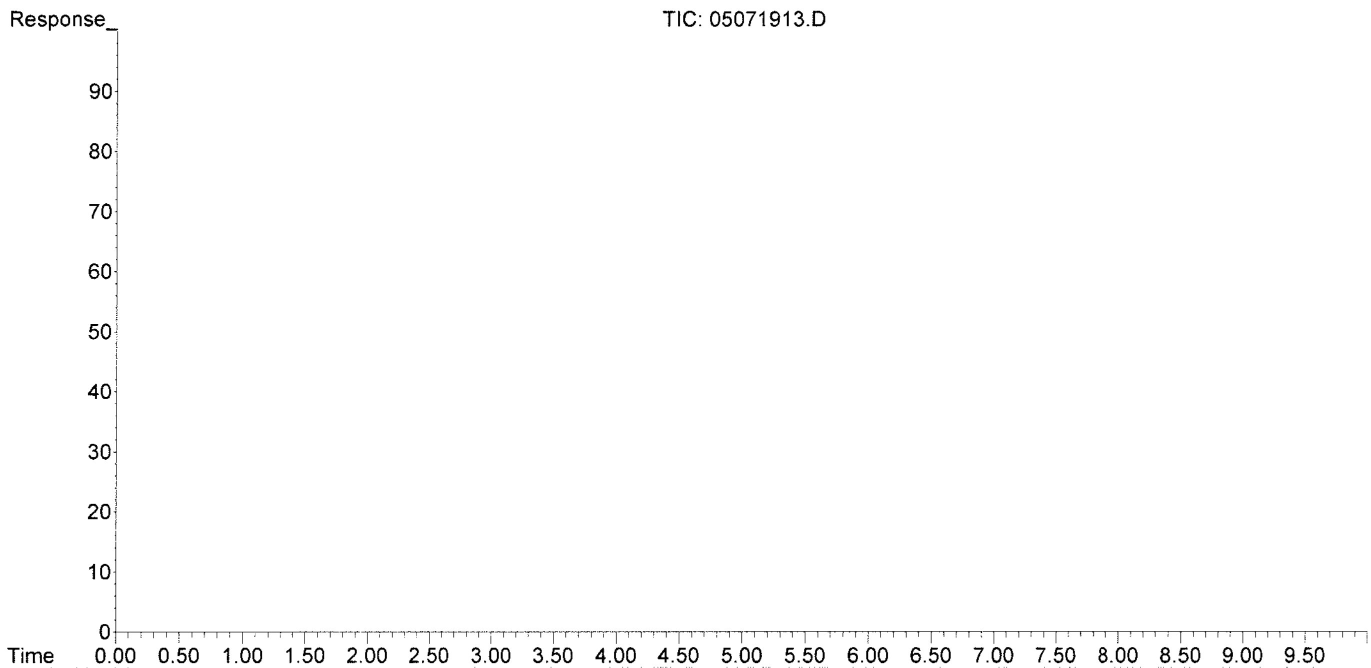
(f)=RT Delta > 1/2 Window (m)=manual int.

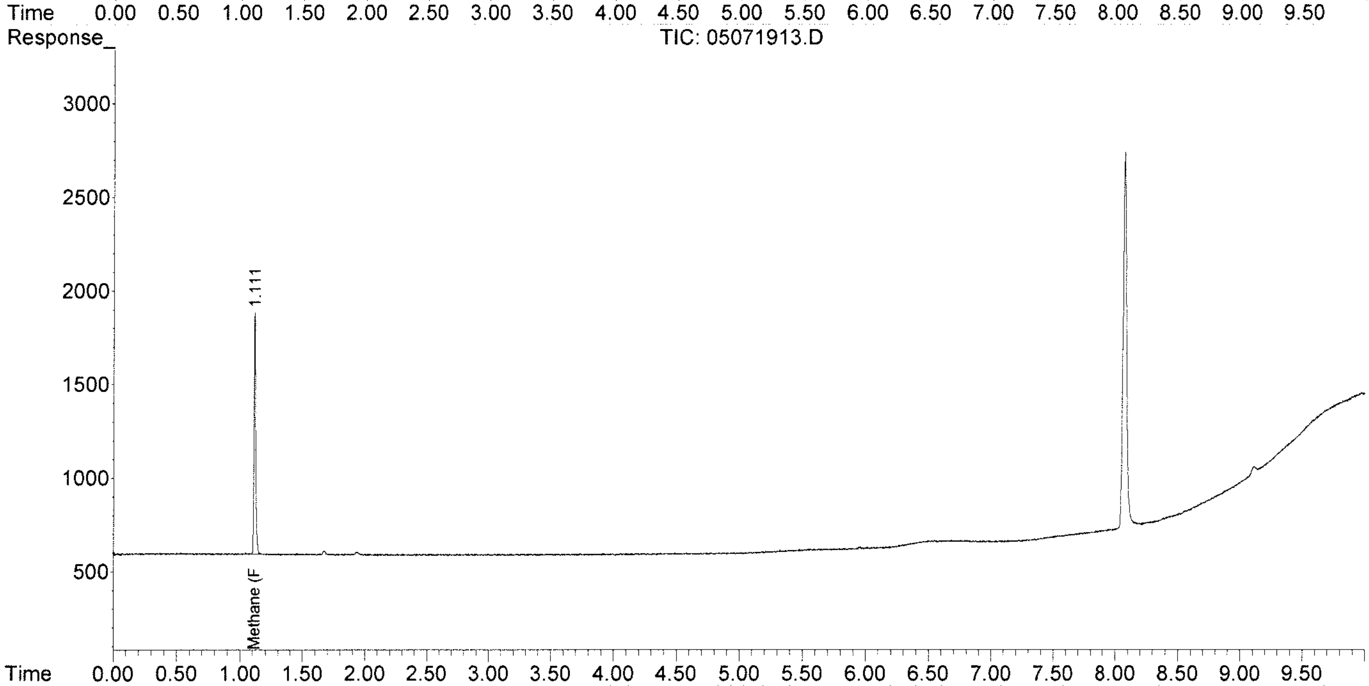
00954899

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071913.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 15:55:45
Operator  : WH
Sample    : P1902518-003 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 17:09:02 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071903.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 12:01:04
Operator : WH
Sample : mcs 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 13:33:48 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

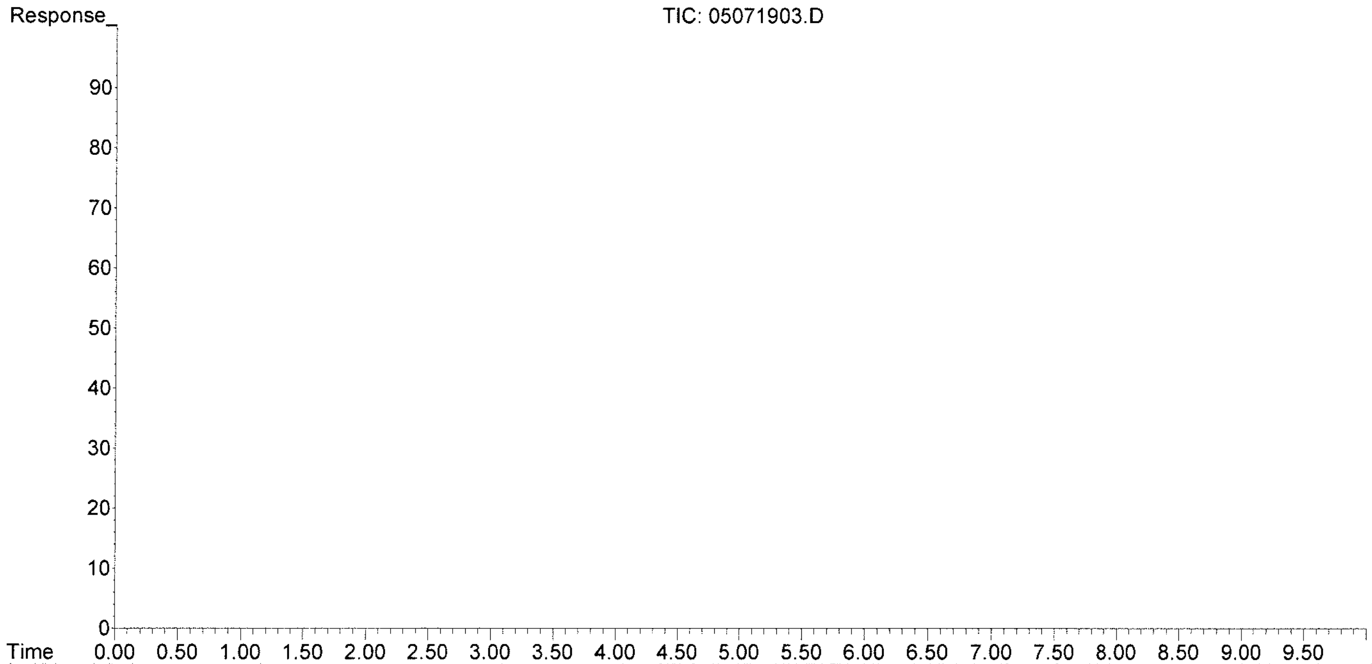
	Compound	R.T.	Response	Conc	Units	
	Target Compounds					
1)	Oxygen/Argon	0.000	0	N.D.	ppm	
2)	Carbon monoxide	0.000	0	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	0.000	0	N.D.	ppm	
6)	Methane (FID)	1.106	860	0.095	ppm	m
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

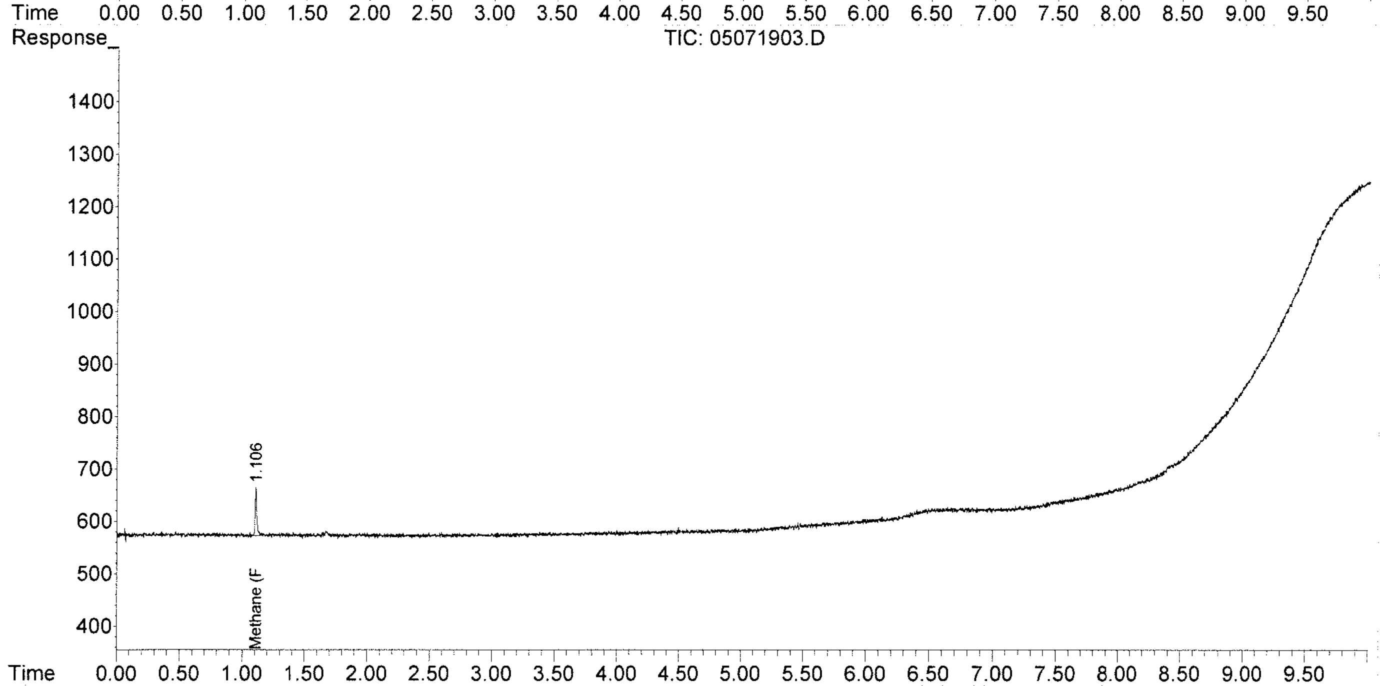
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071903.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 12:01:04
Operator  : WH
Sample    : mcs 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 13:33:48 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase  :                    Signal #2 Phase:
Signal #1 Info   :                    Signal #2 Info  :
```



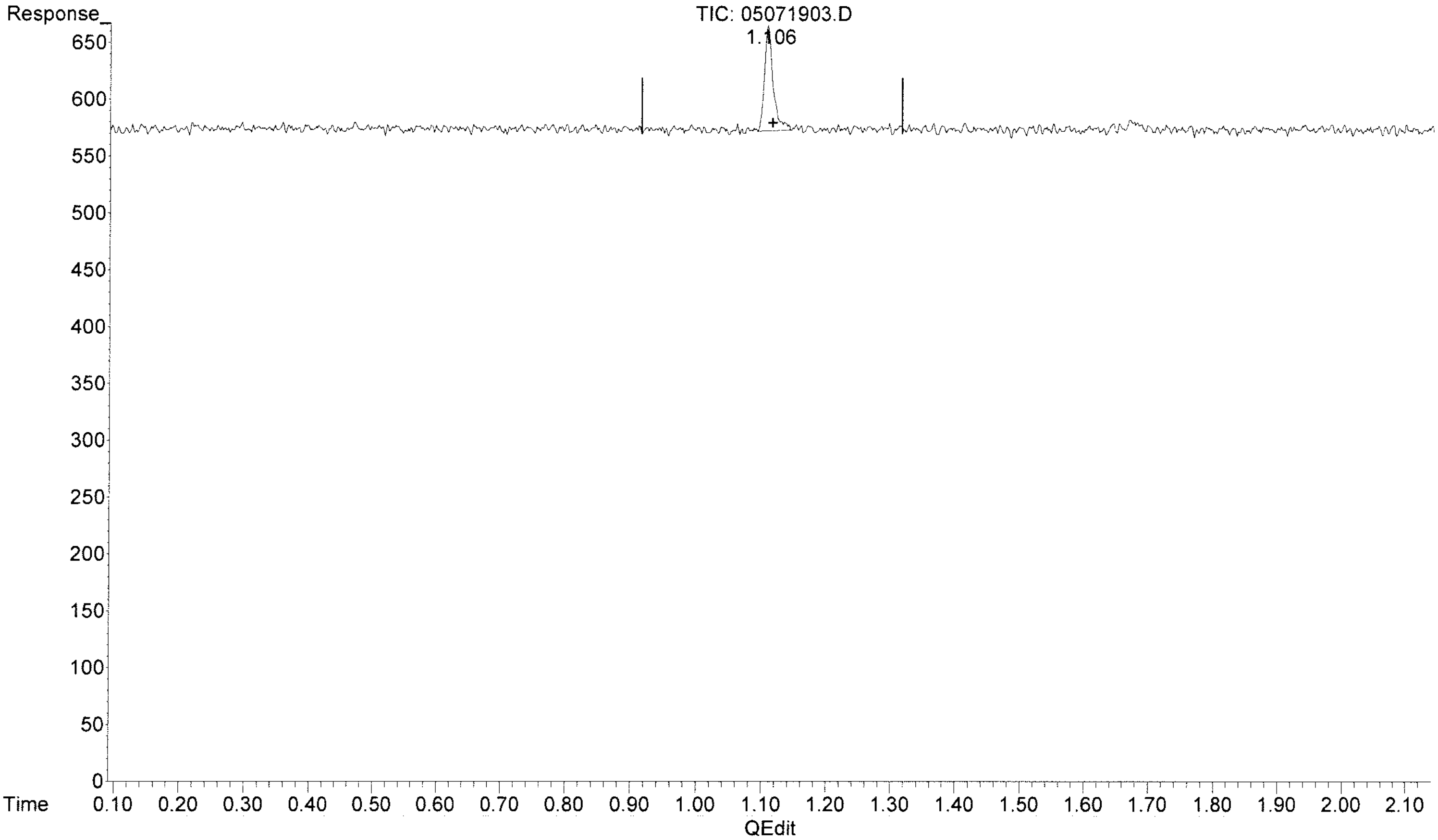


00954902

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071903.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 12:01:04
Operator : WH
Sample : mcs 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 13:33:48 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

1.106min 0.095 ppm m

response 860

MR 5/13/19

WH 5/11/19 no previous MP

(+) = Expected Retention Time
RS091217_R.M Sat May 11 14:49:48 2019

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071904.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 12:38:57
Operator : WH
Sample : fid lcs 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 13:35:23 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

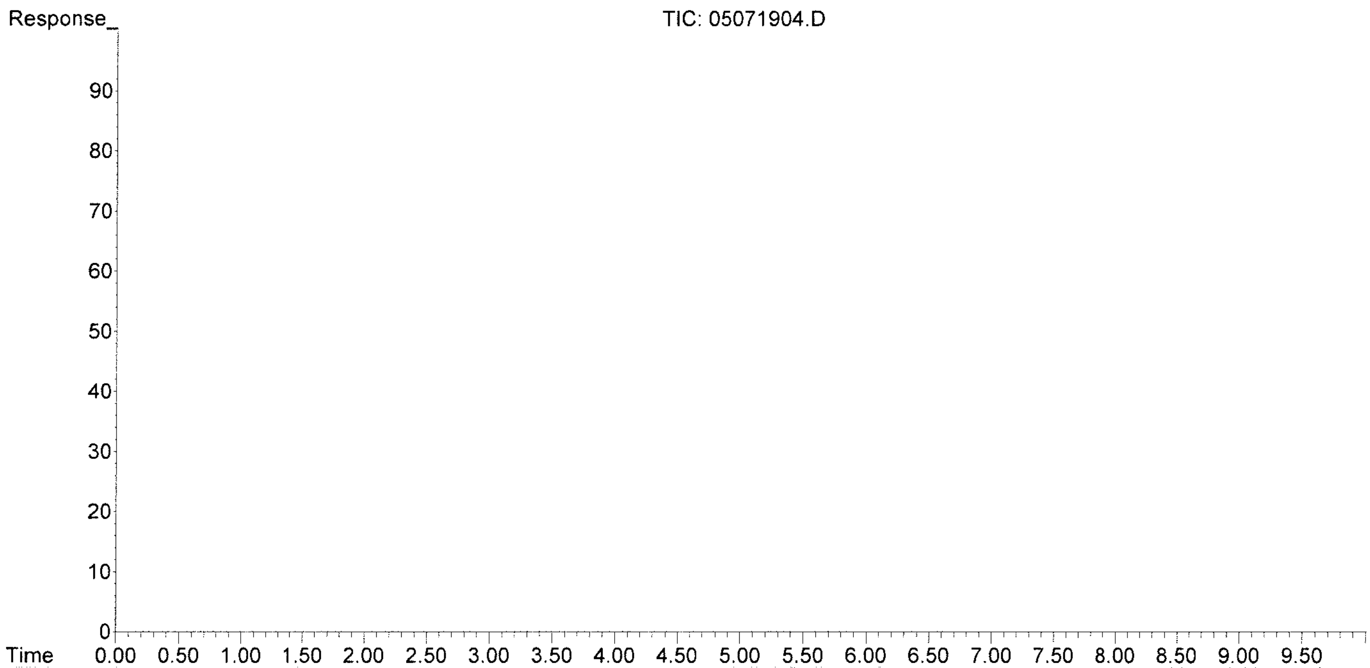
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	0.000	0	N.D.	ppm
2)	Carbon monoxide	0.000	0	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.112	12902	1.422	ppm
7)	Ethylene	1.676	16615	0.993	ppm
8)	Ethane	1.939	20698	1.221	ppm
9)	Propylene	4.319	22550	0.962	ppm
10)	Propane	4.442	32654	1.312	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	6.657	43849	1.647	ppm
13)	n-Butane	6.657	43849	1.647	ppm

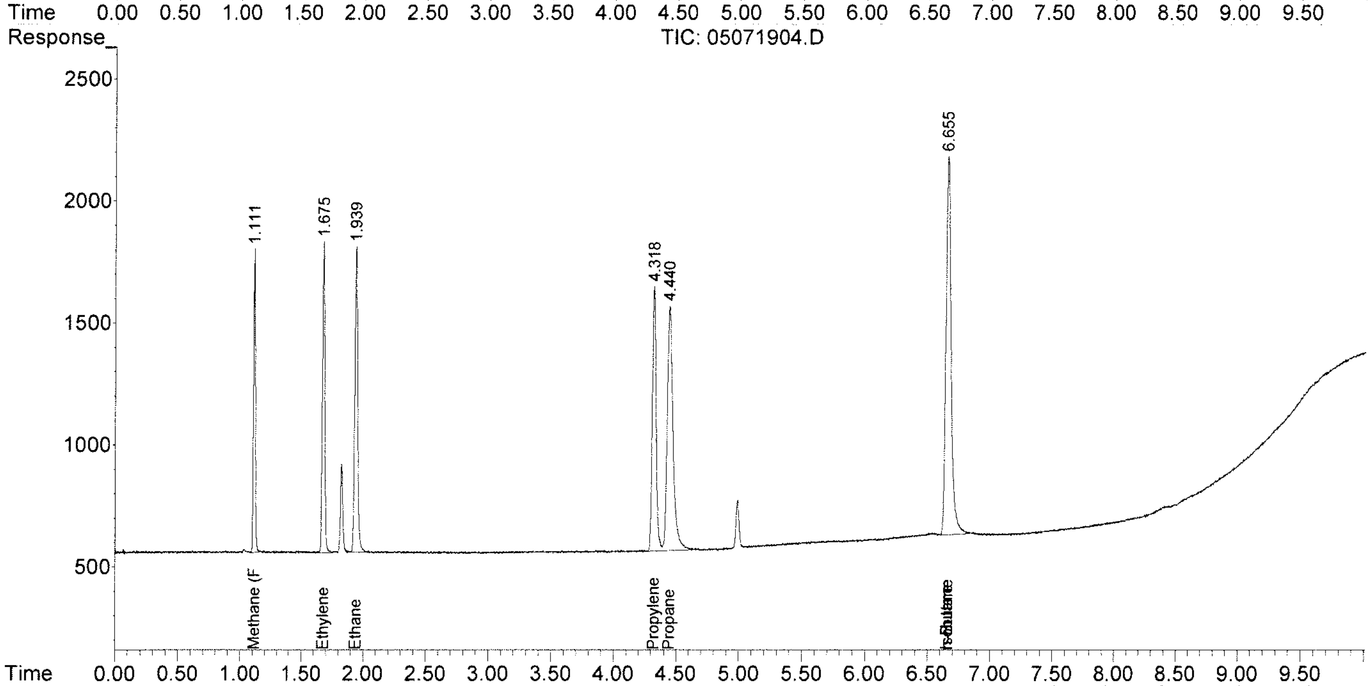
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071904.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 12:38:57
Operator  : WH
Sample    : fid lcs 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 13:35:23 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071905.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 13:13:46
Operator : WH
Sample : fid lcsd 0.1ml
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 13:35:39 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

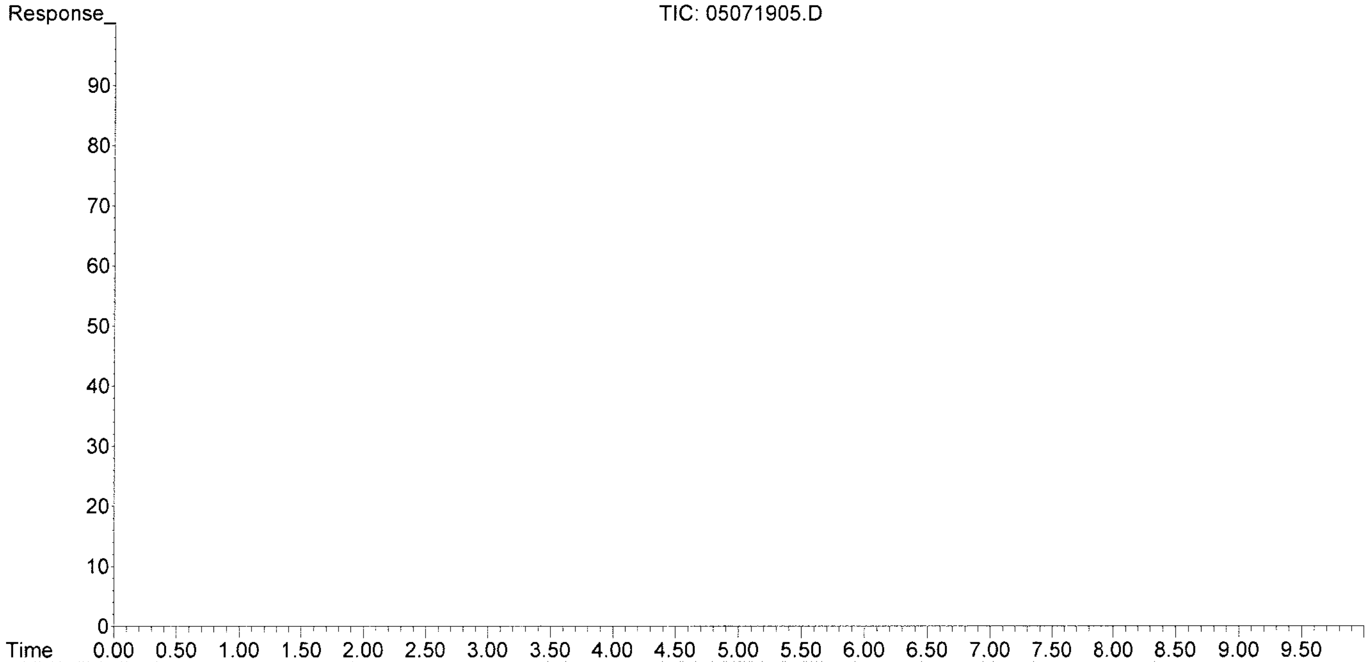
	Compound	R.T.	Response	Conc	Units
	Target Compounds				
1)	Oxygen/Argon	0.000	0	N.D.	ppm
2)	Carbon monoxide	0.000	0	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.115	12863	1.418	ppm
7)	Ethylene	1.678	17106	1.022	ppm
8)	Ethane	1.941	21503	1.269	ppm
9)	Propylene	4.316	23640	1.009	ppm
10)	Propane	4.438	34356	1.381	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	6.653	48963	1.839	ppm
13)	n-Butane	6.653	48963	1.839	ppm

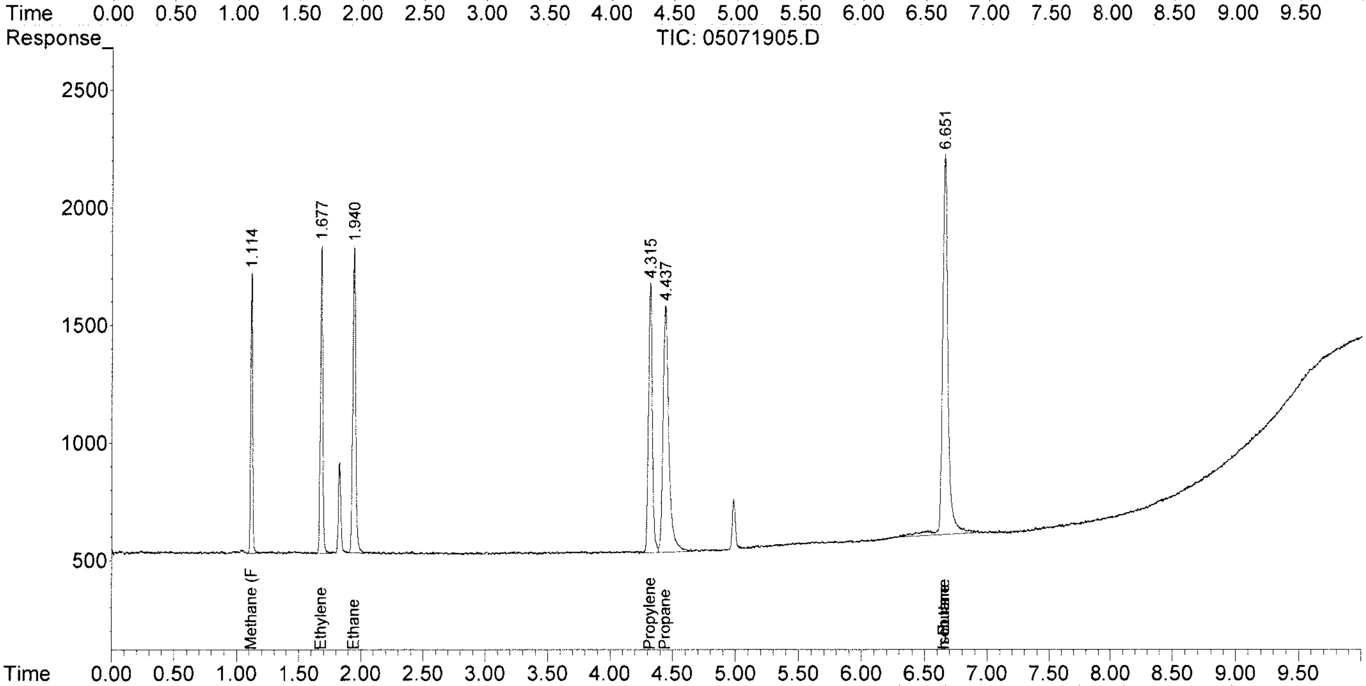
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071905.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 13:13:46
Operator  : WH
Sample    : fid lcsd 0.1ml
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 13:35:39 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Response Factor Report HP5890

Method Path : J:\GC10\METHODS\
Method File : RS091217_R.M
Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
Last Update : Wed Sep 13 11:14:47 2017
Response Via : Initial Calibration

Calibration Files

1	=09121702.D	2	=09121703.D	3	=09121704.D
4	=09121705.D	5	=09121706.D	6	=09121707.D

	Compound	1	2	3	4	5	6	Avg		%RSD
1)	Oxygen/Argon	3.739		1.014			0.001	0.793	E6	189.17
2)	Carbon monoxide	3.739		1.014			0.001	0.594	E6	221.92
3)	Methane (TCD)						2.161	0.951	E2	106.37
4)	Carbon dioxide	2.365	2.569	2.558	2.361	2.459	2.314	2.438	E2	4.44

Signal #2 Calibration Files

1	=09121702.D	2	=09121703.D	3	=09121704.D
4	=09121705.D	5	=09121706.D	6	=09121707.D

	Compound	1	2	3	4	5	6	Avg		%RSD
6)	Methane (FID)		1.180	0.975	0.908	0.870	0.868	0.907	E4	11.66
7)	Ethylene	1.736	1.638	1.780	1.720	1.628	1.670	1.673	E4	3.90
8)	Ethane	1.781	1.676	1.784	1.730	1.692	1.675	1.695	E4	3.83
9)	Propylene	2.505	2.296	2.592	2.480	2.346	2.252	2.343	E4	6.56
10)	Propane	2.439	2.283	2.645	2.555	2.433	2.522	2.488	E4	4.20
11)	Isobutylene							0.652	E1	138.46
12)	Isobutane	6.058	4.793	2.214	1.553	1.353		2.662	E4	86.17
13)	n-Butane	6.058	4.793	2.214	1.553	1.353		2.662	E4	86.17

(#) = Out of Range ### Number of calibration levels exceeded format ###

RS091217_R.M Wed Sep 13 15:11:48 2017

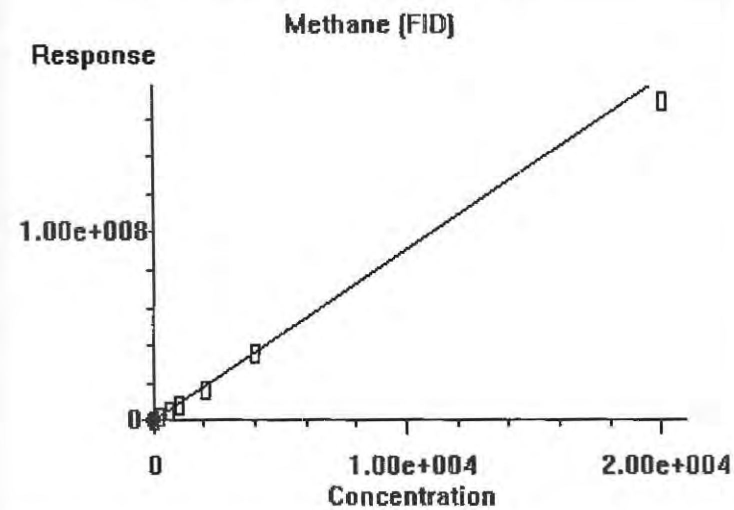
Edit Compounds -- Compound #6 -- Methane (FID)

Search by: Ret Time   Name   Index   Find Compound

- Compound Database
- External Standard Compoun
  - Oxygen/Argon
  - Carbon monoxide
  - Methane (TCD)
  - Carbon dioxide
  - Signal #2
  - Methane (FID)
  - Ethylene
  - Ethane
  - Propylene
  - Propane
  - Isobutylene
  - Isobutane
  - n-Butane

Identification | Calibration | User-Defined | Advanced | Reporting

Lvl ID	Concentration	Response	Lvl ID	Concentration	Response
1	0.151000		11	20000.000000	169009160.49199
2	0.302000	3564.400000			
3	1.510000	14725.268625			
4	4.530000	41128.575000			
5	10.570000	91966.784531			
6	200.000000	1735997.497500			
7	600.000000	5189848.900000			
8	1000.000000	8598533.570000			
9	2000.000000	16098209.390000			
10	4000.000000	35776839.311362			



0.000e+000	Quadratic term
9.071e+003	Linear term
0.000e+000	Constant term
11.657%	RF Rel Std Dev

OK | Cancel | Help | Print Calibration Curve | Copy Calibration Curve

Edit Compounds -- Compound #7 -- Ethylene

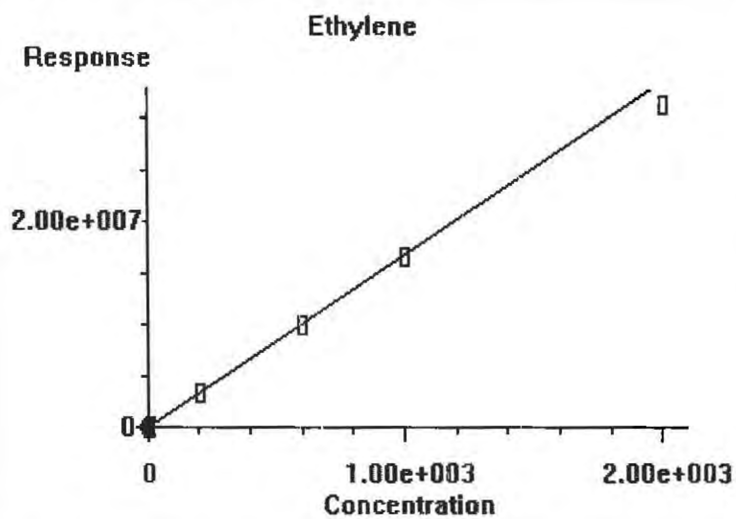
Search by: Ret Time | Name | Index | Find Compound

- Compound Database
- External Standard Compoun
  - Oxygen/Argon
  - Carbon monoxide
  - Methane (TCD)
  - Carbon dioxide
  - Signal #2
  - Methane (FID)
  - Ethylene
  - Ethane
  - Propylene
  - Propane
  - Isobutylene
  - Isobutane
  - n-Butane

Identification | Calibration | User-Defined | Advanced | Reporting

Lvl ID	Concentration	Response
1	0.151000	2621.970000
2	0.302000	4946.731301
3	1.510000	26884.746847
4	4.530000	77902.721497
5	10.570000	172085.529560
6	200.000000	3339702.313219
7	600.000000	10007758.776971
8	1000.000000	16608503.805988
9	2000.000000	31192443.898600
10	4000.000000	

Lvl ID	Concentration	Response
11	20000.000000	



0.000e+000	Quadratic term
1.673e+004	Linear term
0.000e+000	Constant term
3.897%	RF Rel Std Dev

OK | Cancel | Help | Print Calibration Curve | Copy Calibration Curve

00954909

Edit Compounds -- Compound #8 -- Ethane

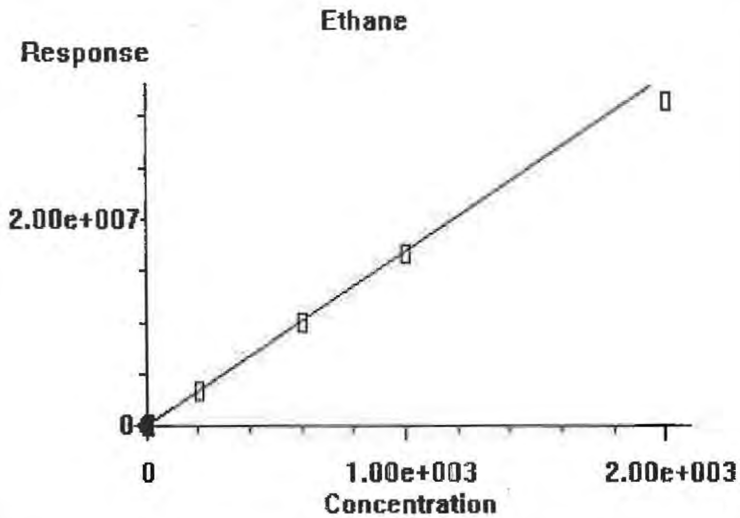
Search by ◉ Ret Time ○ Name ○ Index   Find Compound

- Compound Database
- External Standard Compoun
  - Oxygen/Argon
  - Carbon monoxide
  - Methane (TCD)
  - Carbon dioxide
  - Signal #2
  - Methane (FID)
  - Ethylene
  - Ethane
  - Propylene
  - Propane
  - Isobutylene
  - Isobutane
  - n-Butane

Identification | Calibration | User-Defined | Advanced | Reporting

Lvl ID	Concentration	Response
1	0.151000	2689.928008
2	0.302000	5060.331943
3	1.510000	26943.667500
4	4.530000	78353.525045
5	10.570000	178840.731148
6	200.000000	3350442.319129
7	600.000000	10048964.218029
8	1000.000000	16703164.879012
9	2000.000000	31424217.938900
10	4000.000000	

Lvl ID	Concentration	Response
11	20000.000000	



0.000e+000	Quadratic term
1.695e+004	Linear term
0.000e+000	Constant term
3.831%	RF Rel Std Dev

OK | Cancel | Help | Print Calibration Curve | Copy Calibration Curve

Edit Compounds -- Compound #9 -- Propylene

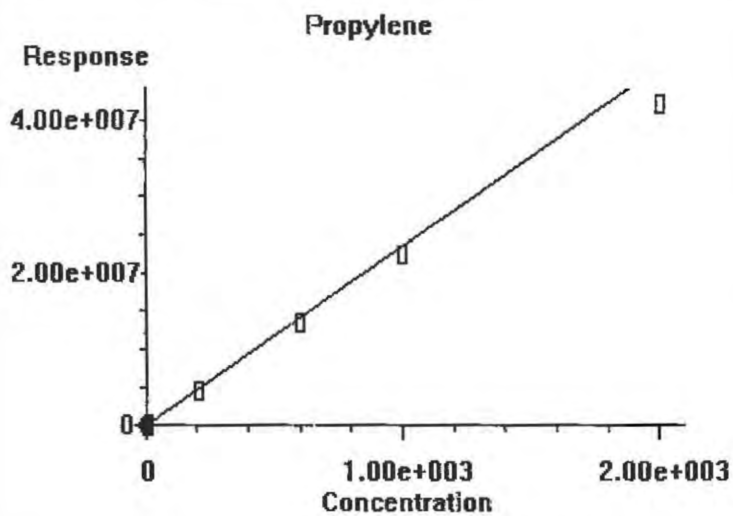
Search by: Ret Time | Name | Index | Find Compound

- Compound Database
- External Standard Compoun
  - Oxygen/Argon
  - Carbon monoxide
  - Methane (TCD)
  - Carbon dioxide
  - Signal #2
  - Methane (FID)
  - Ethylene
  - Ethane
  - Propylene
  - Propane
  - Isobutylene
  - Isobutane
  - n-Butane

Identification | Calibration | User-Defined | Advanced | Reporting

Lvl ID	Concentration	Response
1	0.151000	3782.537646
2	0.302000	6933.285530
3	1.510000	39139.518208
4	4.530000	112341.896872
5	10.570000	248003.903623
6	200.000000	4504060.086084
7	600.000000	13569342.761419
8	1000.000000	22494887.720990
9	2000.000000	42124689.656800
10	4000.000000	

Lvl ID	Concentration	Response
11	20000.000000	



0.000e+000	Quadratic term
2.343e+004	Linear term
0.000e+000	Constant term
6.559%	RF Rel Std Dev

OK | Cancel | Help | Print Calibration Curve | Copy Calibration Curve

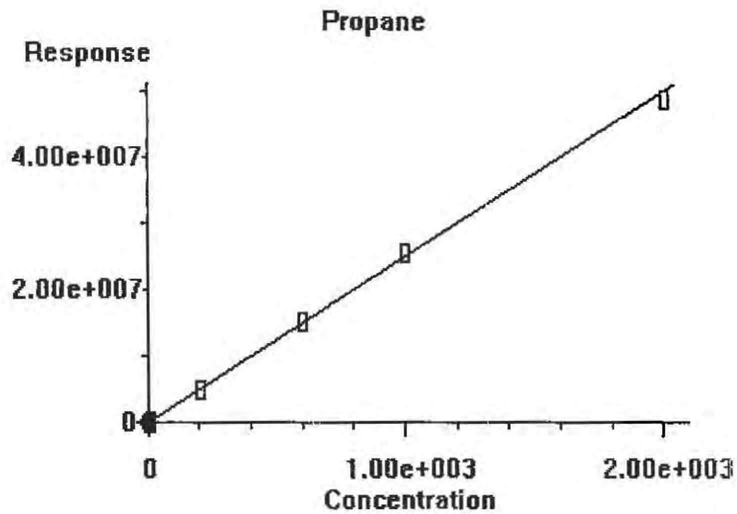
Edit Compounds -- Compound #10 -- Propane

Search by Ret Time Name Index Find Compound

- Compound Database
- External Standard Compoun
  - Oxygen/Argon
  - Carbon monoxide
  - Methane (TCD)
  - Carbon dioxide
  - Signal #2
  - Methane (FID)
  - Ethylene
  - Ethane
  - Propylene
  - Propane
  - Isobutylene
  - Isobutane
  - n-Butane

Identification | Calibration | User-Defined | Advanced | Reporting

Lvl ID	Concentration	Response	Lvl ID	Concentration	Response
1	0.151000	3682.897354	11	20000.000000	
2	0.302000	6894.237803			
3	1.510000	39934.166792			
4	4.530000	115723.428128			
5	10.570000	257124.432806			
6	200.000000	5043035.663916			
7	600.000000	15251325.797404			
8	1000.000000	25459410.657938			
9	2000.000000	48583085.287451			
10	4000.000000				



0.000e+000	Quadratic term
2.488e+004	Linear term
0.000e+000	Constant term
4.200%	RF Rel Std Dev

OK | Cancel | Help | Print Calibration Curve | Copy Calibration Curve

Calibration Status Report HP5890

Method Path : J:\GC10\METHODS\
Method File : RS091217_R.M
Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
Last Update : Wed Sep 13 11:14:47 2017
Response Via : Initial Calibration

#	ID	Conc	ISTD Conc	Path\File
1	1	0	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121702.D
2	2	0	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121703.D
3	3	3	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121704.D
4	4	10	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121705.D
5	5	25	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121706.D
6	6	125	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121707.D
7	7	5000	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121708.D
8	8	25000	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121709.D
9	9	2000	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121710.D
10	10	30000	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121711.D
11	11	20000	0	J:\GC10\DATA\RSK_FID\2017_09\12\09121712.D

#	ID	Update Time	Quant Time	Acquisition Time
1	1	Sep 13 11:04 2017	Sep 12 15:03 2017	12-Sep-2017, 10:52
2	2	Sep 13 11:05 2017	Sep 13 11:05 2017	12-Sep-2017, 11:05
3	3	Sep 13 11:06 2017	Sep 13 11:05 2017	12-Sep-2017, 11:45
4	4	Sep 13 11:09 2017	Sep 13 11:06 2017	12-Sep-2017, 12:09
5	5	Sep 13 11:09 2017	Sep 13 11:09 2017	12-Sep-2017, 12:30
6	6	Sep 13 11:10 2017	Sep 13 11:10 2017	12-Sep-2017, 12:47
7	7	Sep 13 11:11 2017	Sep 13 11:10 2017	12-Sep-2017, 13:00
8	8	Sep 13 11:12 2017	Sep 13 11:11 2017	12-Sep-2017, 13:47
9	9	Sep 13 11:12 2017	Sep 13 11:12 2017	12-Sep-2017, 14:07
10	10	Sep 13 11:14 2017	Sep 13 11:13 2017	12-Sep-2017, 14:48
11	11	Sep 13 11:14 2017	Sep 13 11:14 2017	12-Sep-2017, 15:21

RS091217_R.M Wed Sep 13 15:11:22 2017

Quantitation Report (QT Reviewed)

Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121702.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 10:52
Operator : MC
Sample : 0.151ppm 0.250ml s32-09121702
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 12 11:03:15 2017
Quant Method : I:\GC10\METHODS\RS082417.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Fri Aug 25 09:19:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	1.767	373920	0.128	ppm	
2)	Carbon monoxide	1.767	373920	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	0.000	0	N.D.	ppm	
6)	Methane (FID)	0.000	0	N.D.	ppm	d
7)	Ethylene	1.595	2622	0.156	ppm	
8)	Ethane	1.848	2690	0.156	ppm	
9)	Propylene	4.222	3783	0.154	ppm	
10)	Propane	4.348	3683	0.139	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	6.582f	6058	NoCal	ppm	
13)	n-Butane	6.582f	6058	NoCal	ppm	

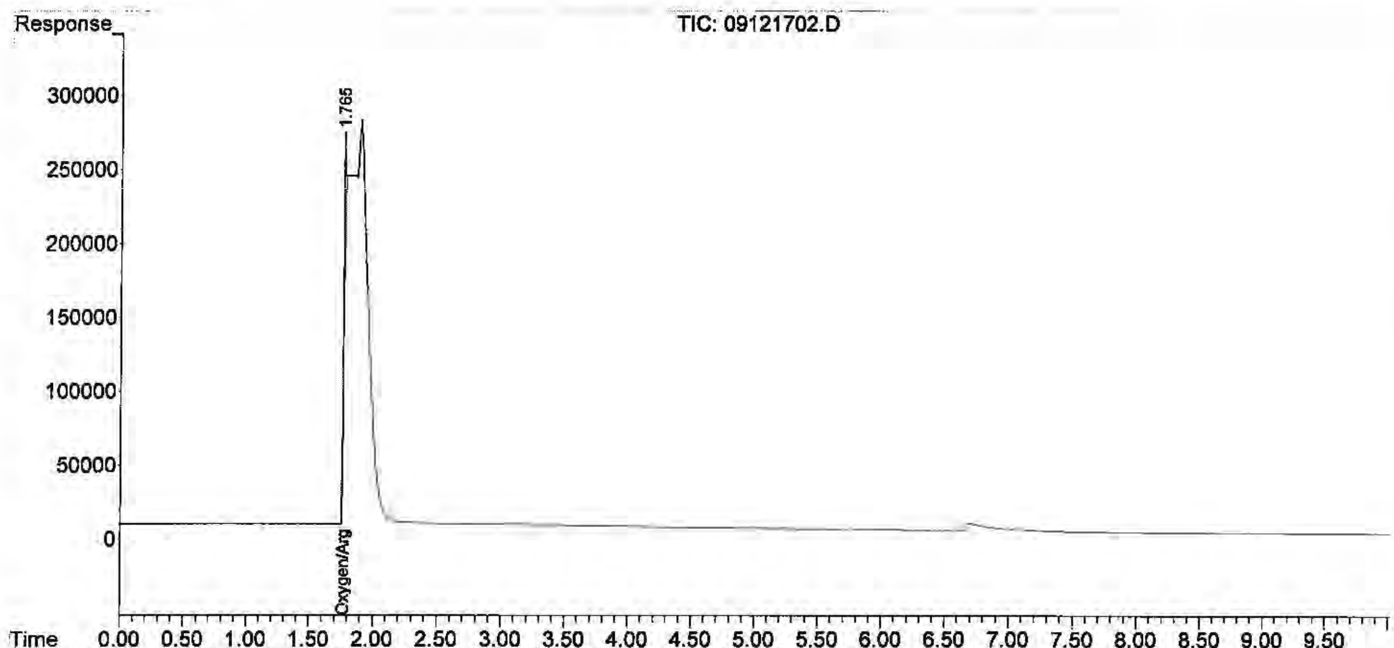
(f)=RT Delta > 1/2 Window (m)=manual int.

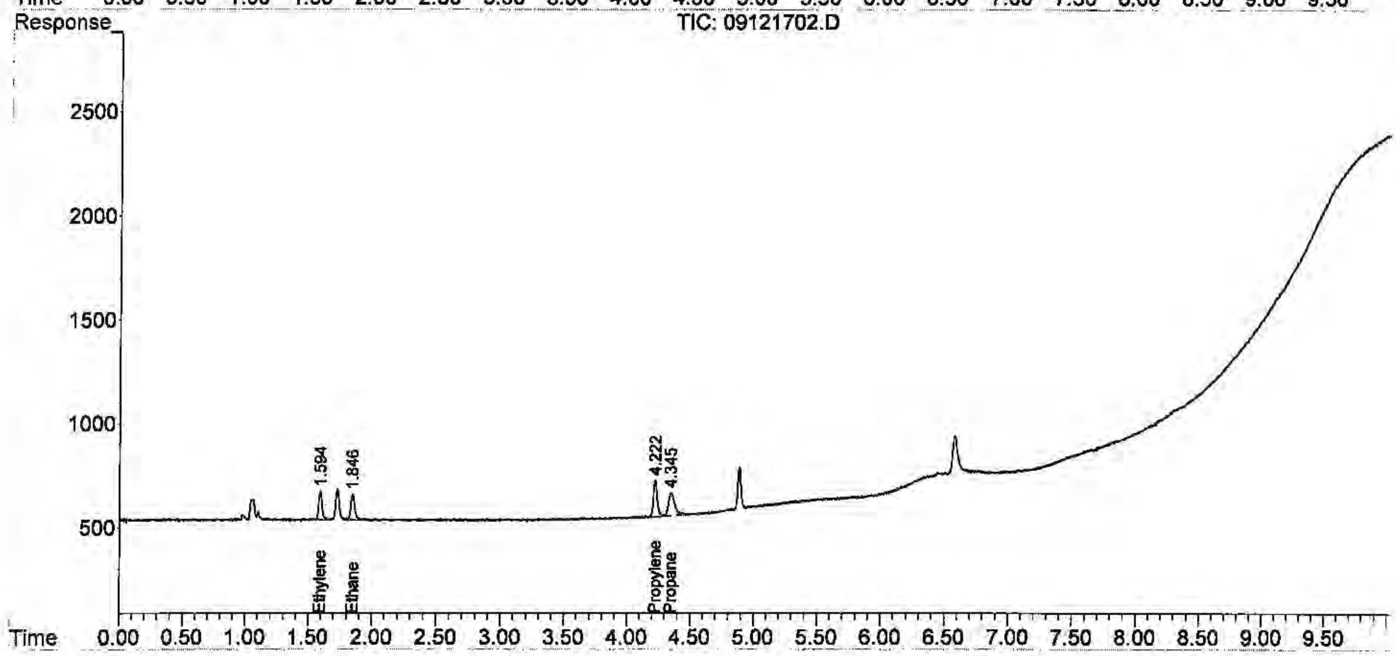
MC 9/13/17

```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121702.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 10:52
Operator  : MC
Sample    : 0.151ppm 0.250ml  s32-09121702
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 12 11:03:15 2017
Quant Method : I:\GC10\METHODS\RS082417.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Fri Aug 25 09:19:14 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.       :
Signal #1 Phase  :                   Signal #2 Phase:
Signal #1 Info   :                   Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121703.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 11:05
Operator : MC
Sample : 0.302ppm 0.5ml s32-09121702
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:05:03 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

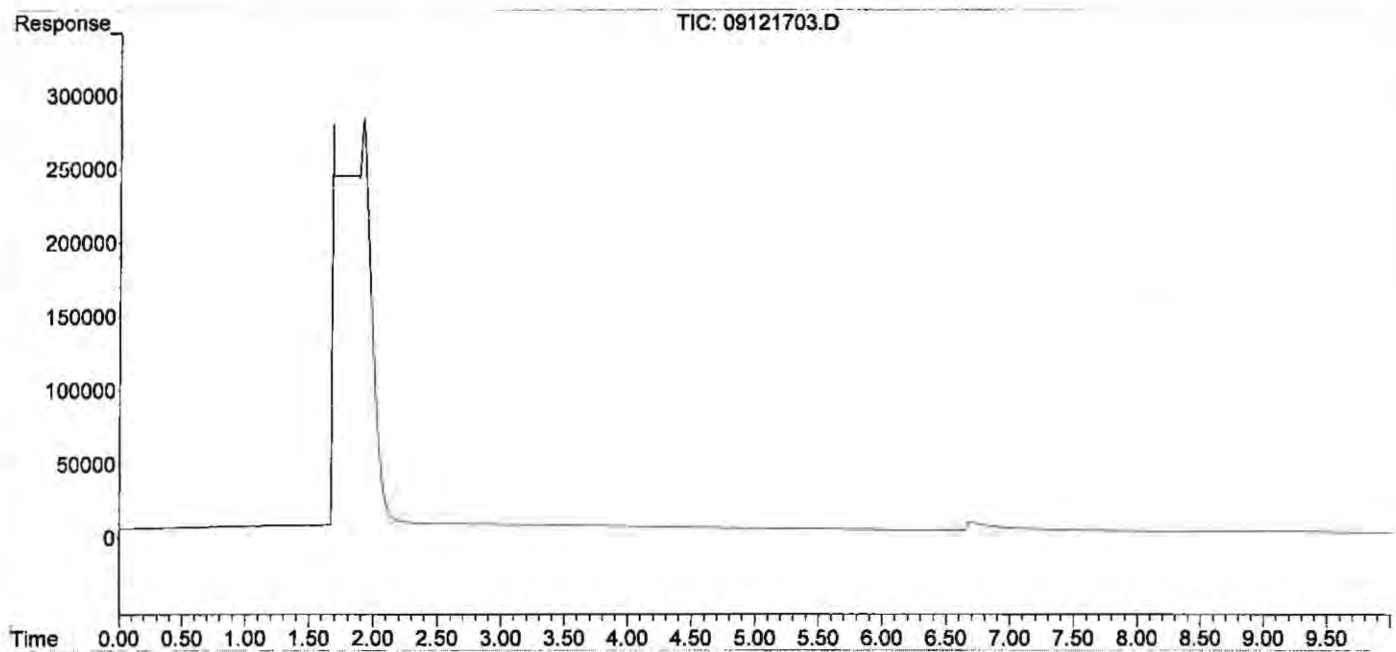
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	1.913f	-25181981	N.D.	ppm	
2)	Carbon monoxide	1.913f	-25181981	1.089	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	
4)	Carbon dioxide	0.000	0	N.D.	ppm	
6)	Methane (FID)	1.049	3564	0.391	ppm	m
7)	Ethylene	1.577	4947	0.292	ppm	
8)	Ethane	1.828	5060	0.293	ppm	
9)	Propylene	4.207	6933	0.281	ppm	
10)	Propane	4.337	6894	0.268	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	6.579f	9587	0.158	ppm	
13)	n-Butane	6.579f	9587	0.158	ppm	

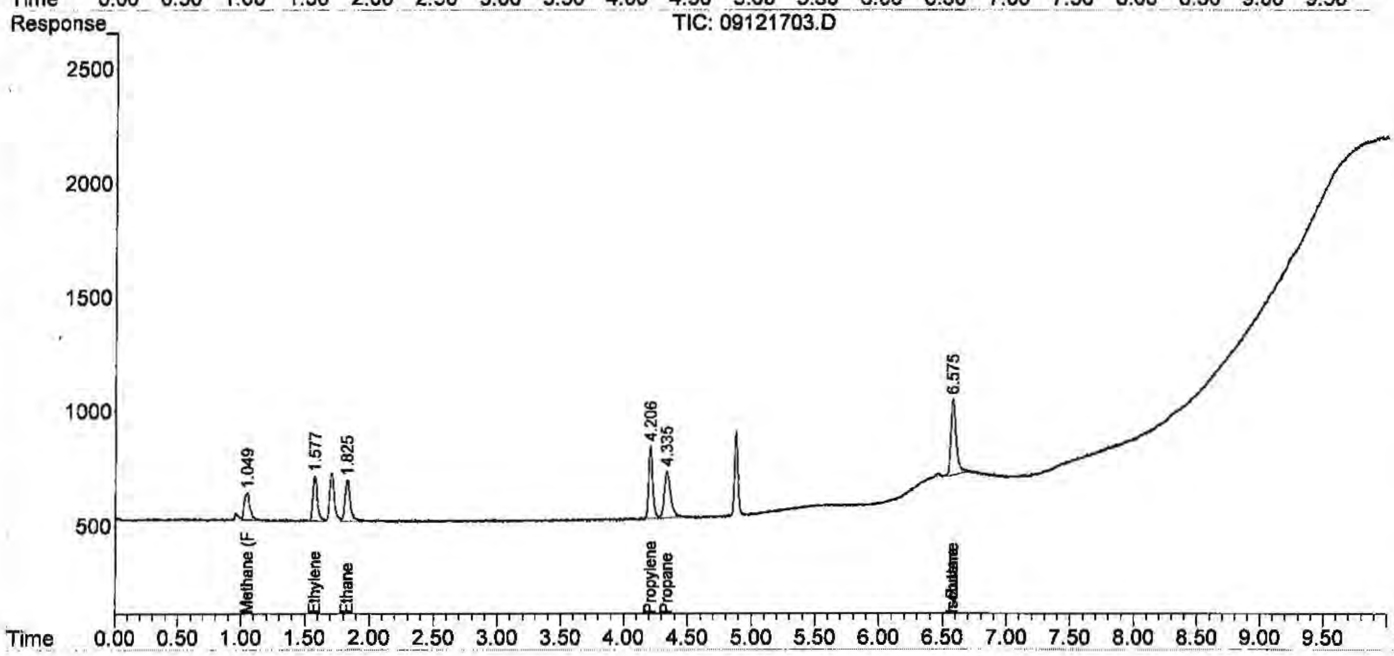
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121703.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 11:05
Operator  : MC
Sample    : 0.302ppm 0.5ml s32-09121702
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:05:03 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```



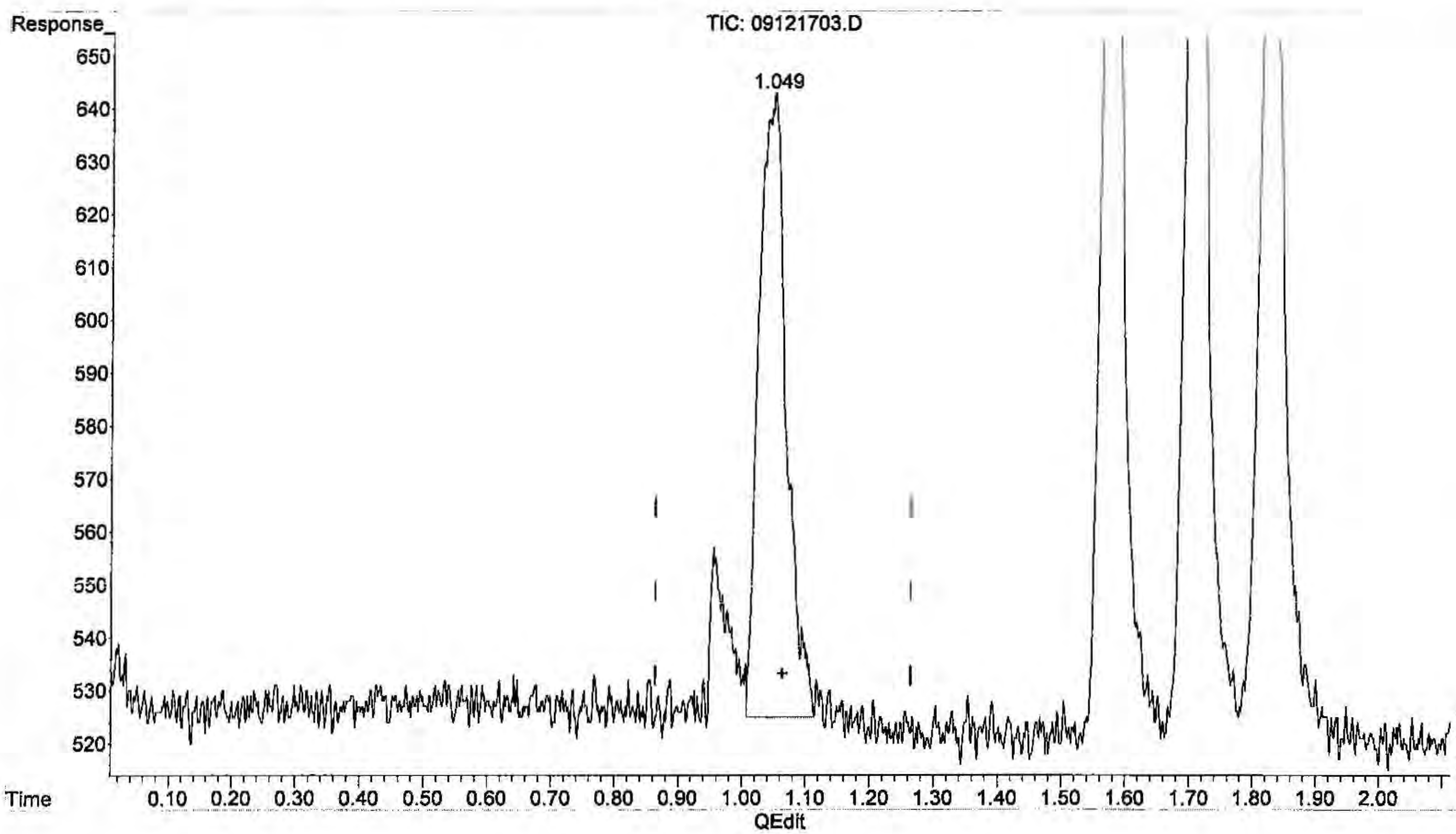


00954918

```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121703.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 11:05
Operator  : MC
Sample    : 0.302ppm 0.5ml s32-09121702
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:05:03 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase :                 Signal #2 Phase:
Signal #1 Info  :                 Signal #2 Info :
```



(6) Methane (FID)

1.049min 0.391 ppm m

response 3564

M 9/13/17
Bu
Ni prwn

W 9/21/17

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121704.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 11:45
Operator : MC
Sample : 1.51ppm 0.1ml s32-09051701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:05:55 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

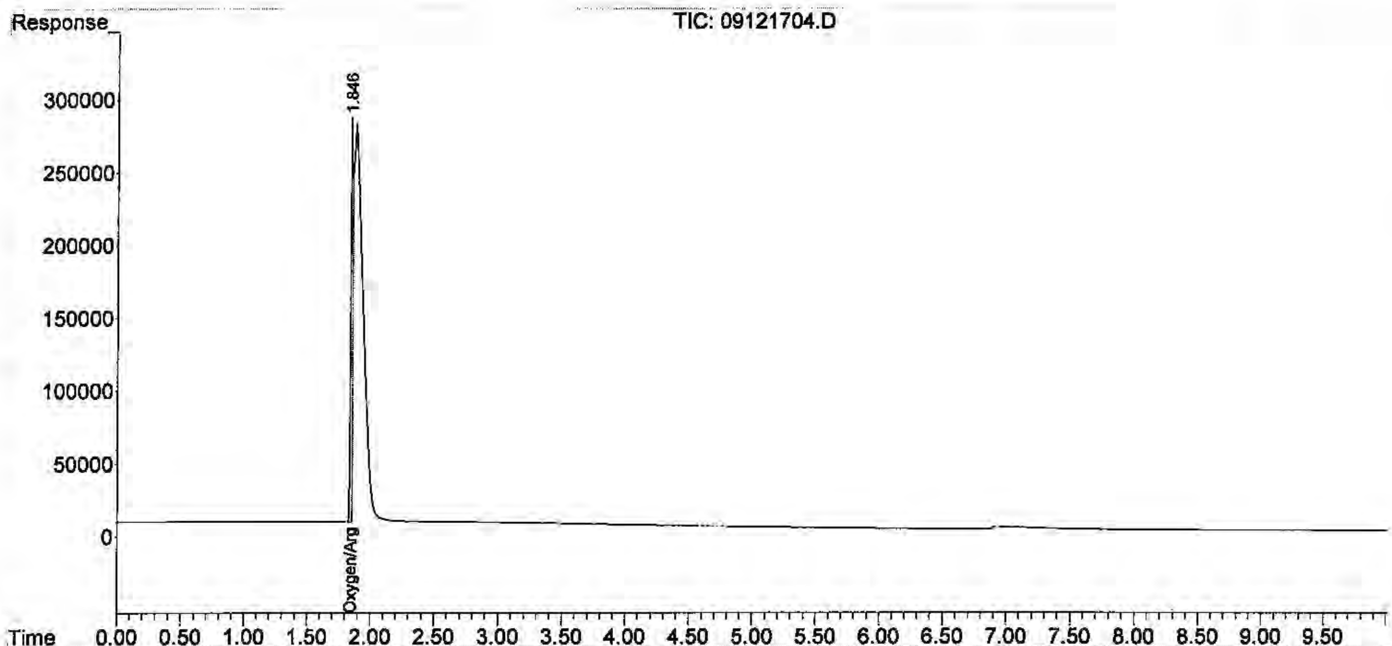
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	1.847	2536230	1.056	ppm
2)	Carbon monoxide	1.847	2536230	N.D.	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.064	14725	1.613	ppm
7)	Ethylene	1.598	26885	1.582	ppm
8)	Ethane	1.851	26944	1.555	ppm
9)	Propylene	4.220	39140	1.589	ppm
10)	Propane	4.349	39934	1.596	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	6.578f	55348	1.020	ppm
13)	n-Butane	6.578f	55348	1.020	ppm

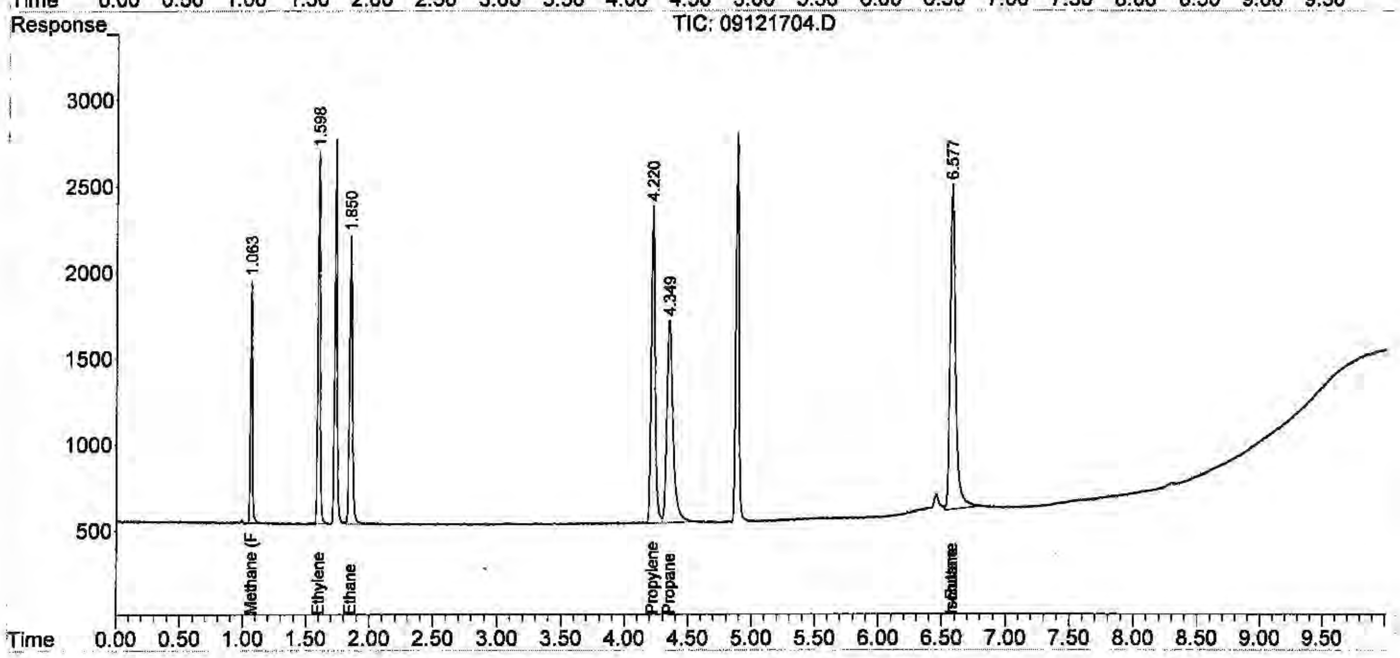
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121704.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 11:45
Operator  : MC
Sample    : 1.51ppm 0.1ml s32-09051701
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:05:55 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase  :                  Signal #2 Phase:
Signal #1 Info   :                  Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121705.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 12:09
Operator : MC
Sample : 4.53ppm 0.3ml s32-09051701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:06:32 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

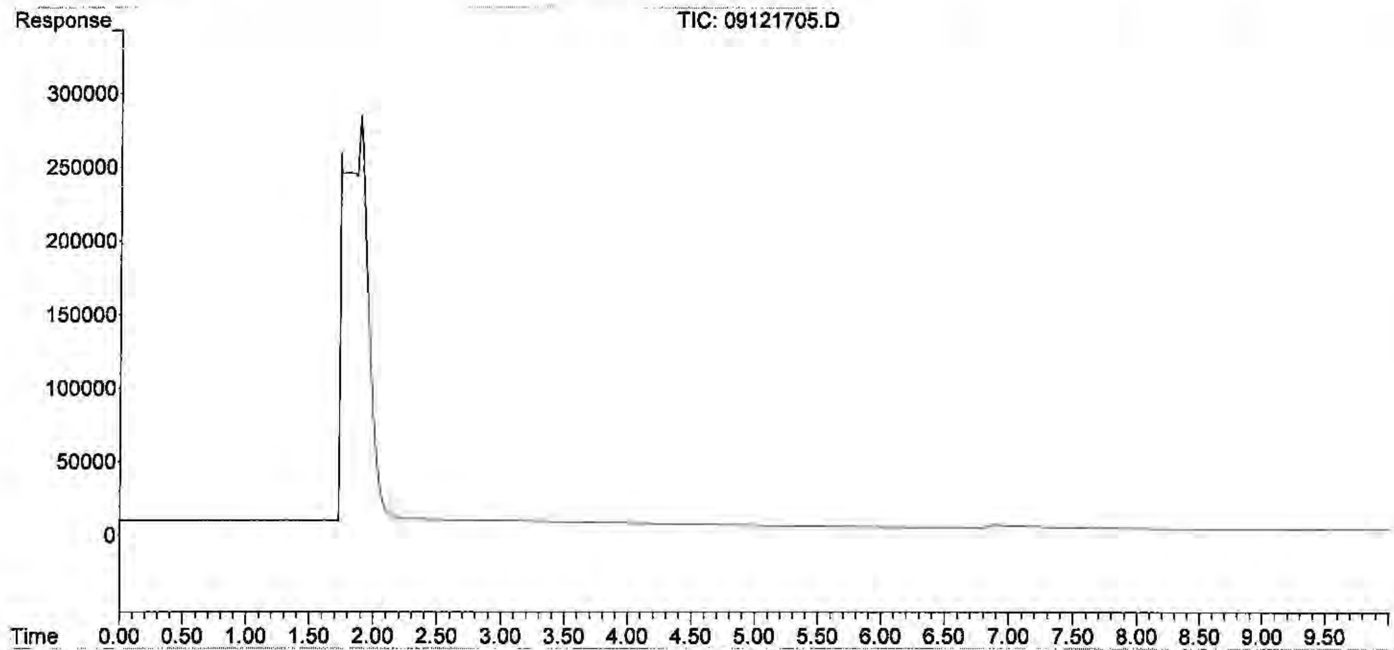
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	1.738	-331216	N.D.	ppm
2)	Carbon monoxide	1.738	-331216	0.019	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.052	41129	4.522	ppm
7)	Ethylene	1.586	77903	4.637	ppm
8)	Ethane	1.838	78354	4.558	ppm
9)	Propylene	4.218	112342	4.614	ppm
10)	Propane	4.347	115723	4.680	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	6.580f	155256	3.565	ppm
13)	n-Butane	6.580f	155256	3.565	ppm

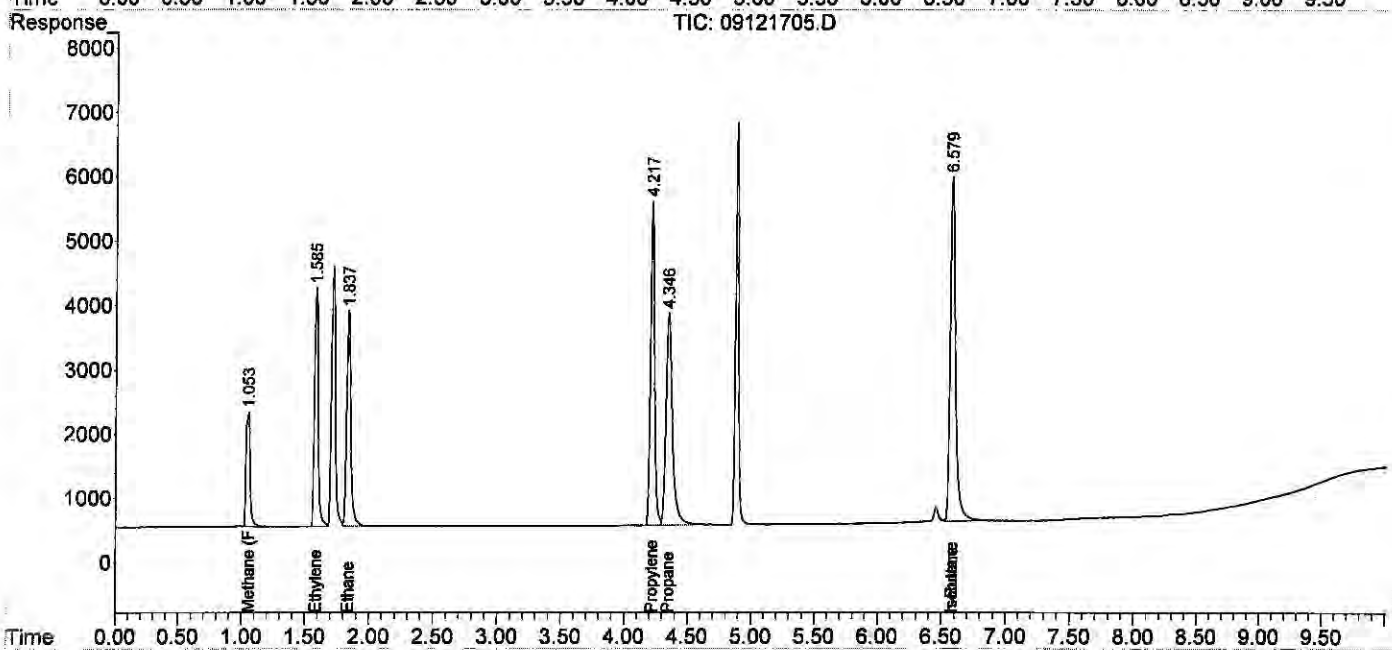
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121705.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 12:09
Operator  : MC
Sample    : 4.53ppm 0.3ml s32-09051701
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:06:32 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.       :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121706.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 12:30
Operator : MC
Sample : 10.57ppm 0.7ml s32-09051701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:09:24 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

	Compound	R.T.	Response	Conc	Units
	Target Compounds				
1)	Oxygen/Argon	1.929f	-31871242	N.D.	ppm
2)	Carbon monoxide	1.929f	-31871242	1.818	ppm
3)	Methane (TCD)	0.000	0	N.D.	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.025	91967	10.135	ppm
7)	Ethylene	1.568	172086	10.273	ppm
8)	Ethane	1.822	178841	10.441	ppm
9)	Propylene	4.214	248004	10.236	ppm
10)	Propane	4.344	257124	10.458	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	6.578f	338181	9.254	ppm
13)	n-Butane	6.578f	338181	9.254	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

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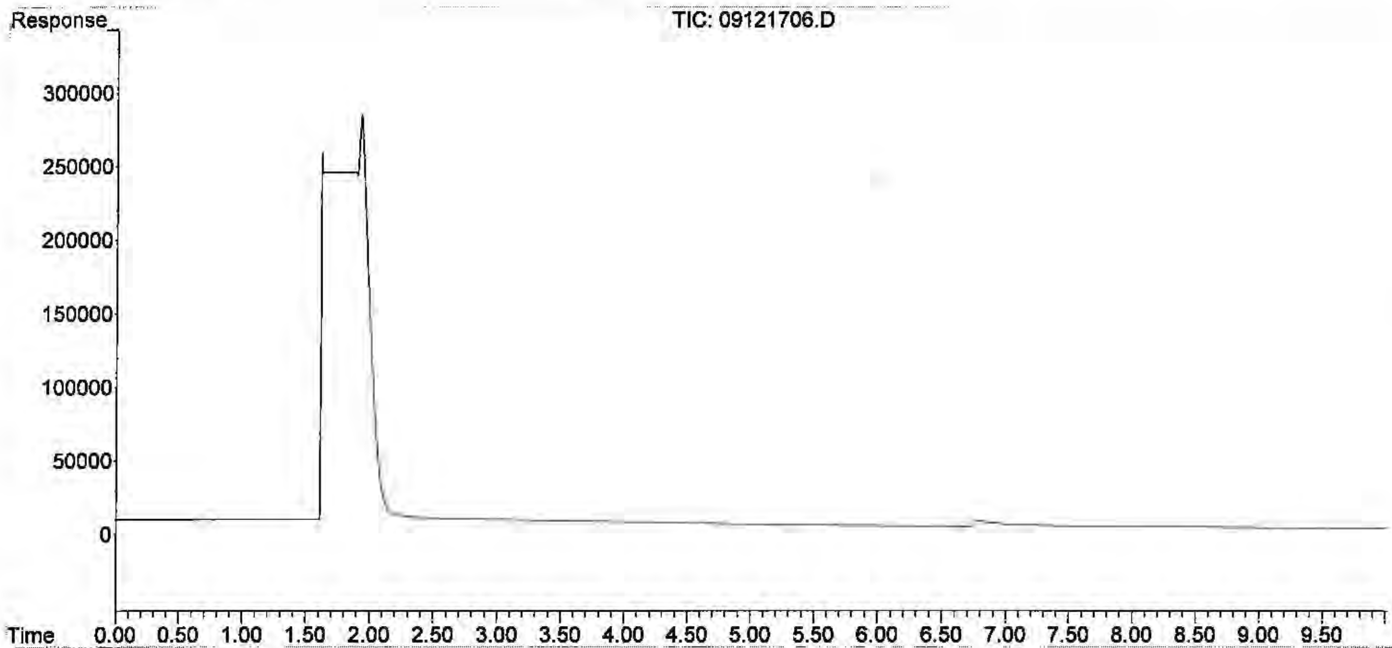
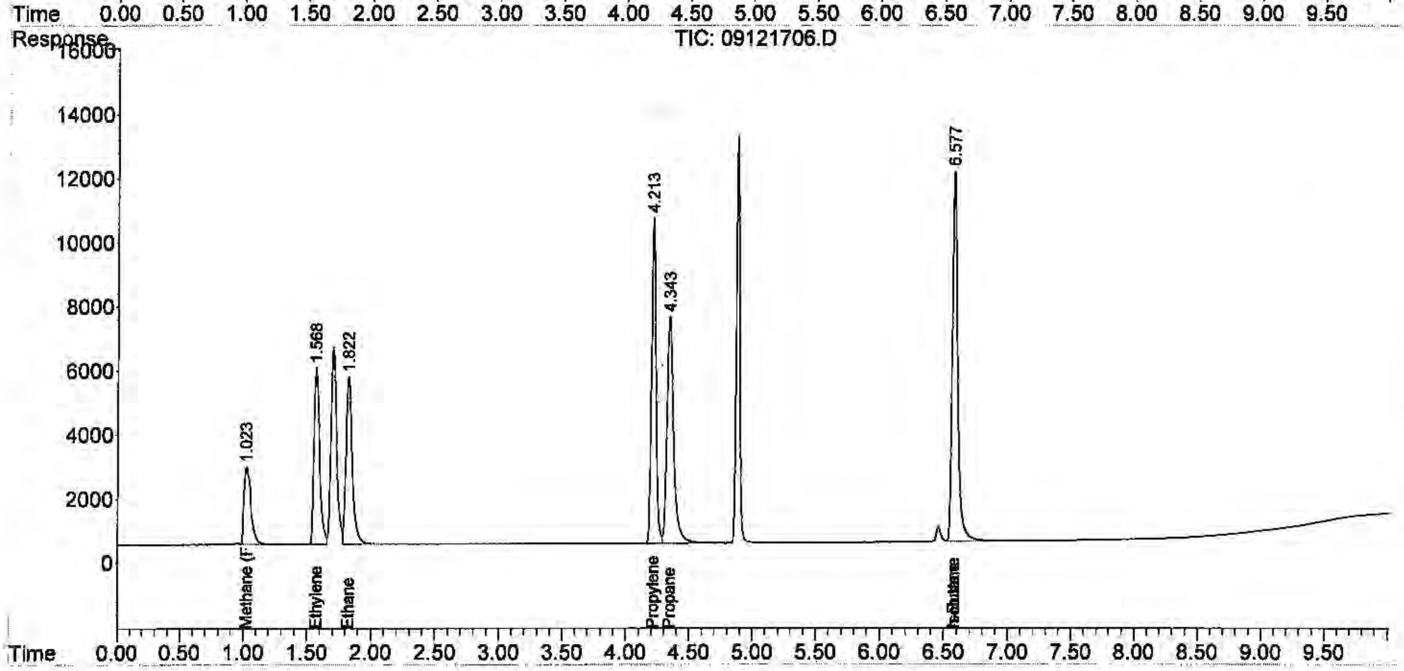
```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121706.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 12:30
Operator  : MC
Sample    : 10.57ppm 0.7ml s32-09051701
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:09:24 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                 Signal #2 Phase:
Signal #1 Info  :                 Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121707.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 12:47
Operator : MC
Sample : 200ppm 0.1ml s32-09121701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:09:59 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

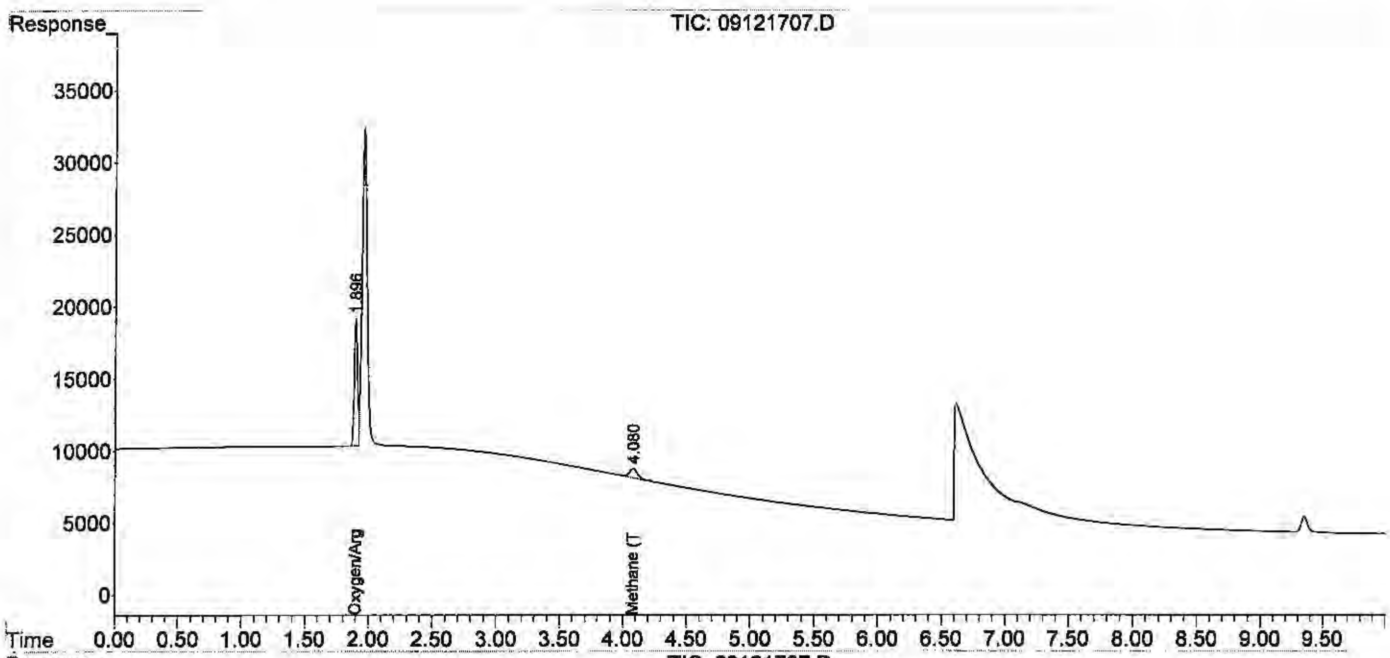
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	1.897	155286	0.065	ppm
2)	Carbon monoxide	1.897	155286	N.D.	ppm
3)	Methane (TCD)	4.079f	27015	2856.472	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.063	1735997	190.792	ppm
7)	Ethylene	1.597	3339702	198.758	ppm
8)	Ethane	1.849	3350442	194.597	ppm
9)	Propylene	4.201	4504060	185.706	ppm
10)	Propane	4.333	5043036	204.809	ppm
11)	Isobutylene	0.000	0	N.D.	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

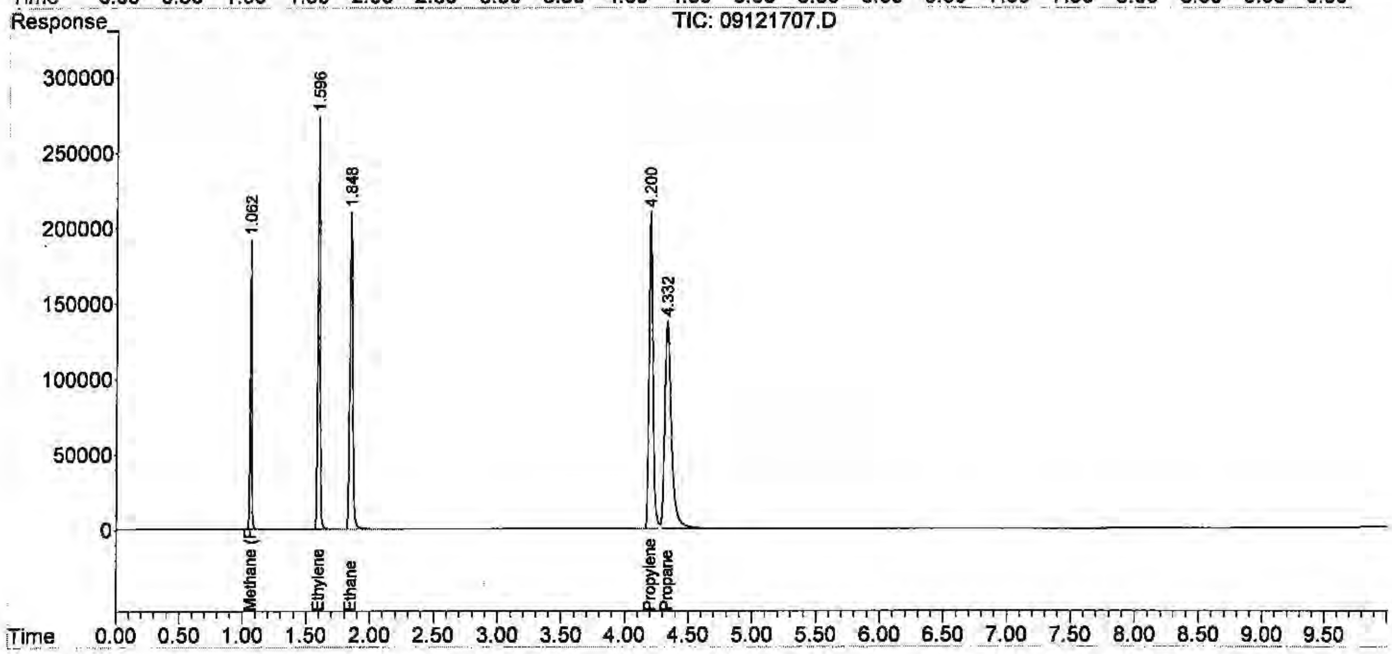
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121707.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 12:47
Operator : MC
Sample : 200ppm 0.1ml s32-09121701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:09:59 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:04:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121708.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 13:00
Operator : MC
Sample : 600ppm 0.3ml s32-09121701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:10:57 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:10:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

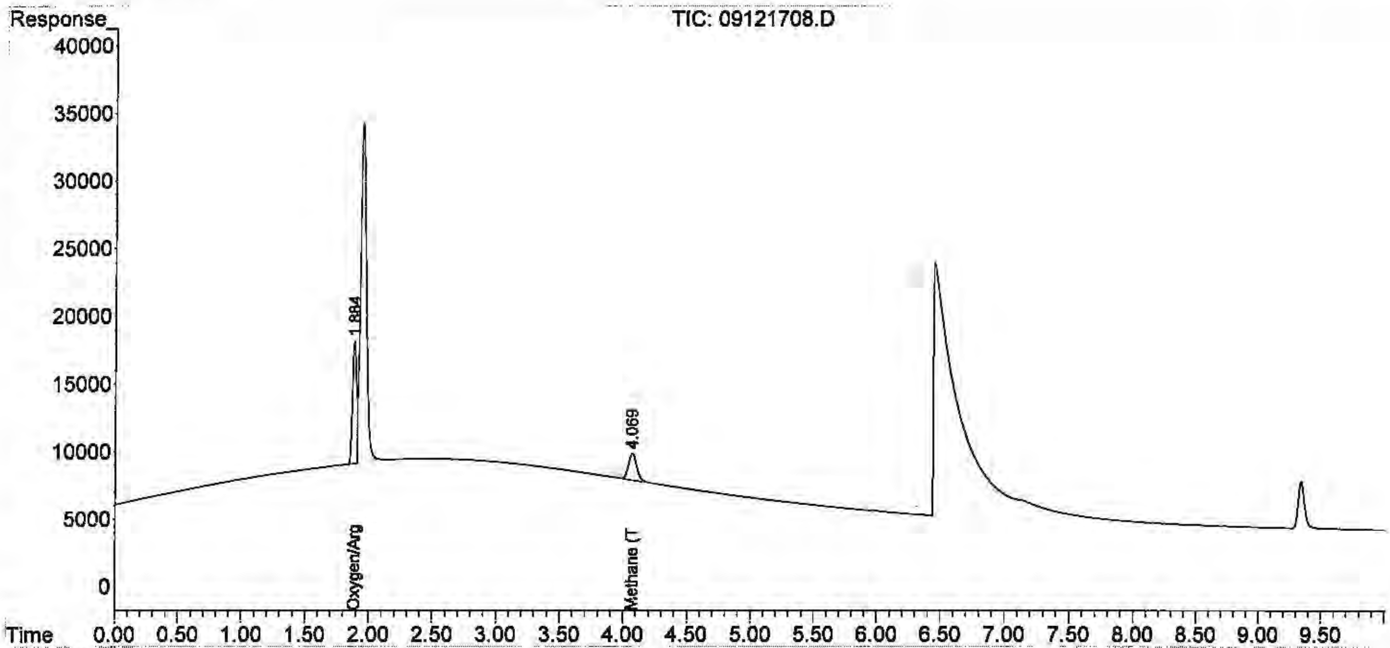
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	1.884	196022	0.124	ppm
2)	Carbon monoxide	1.884	196022	N.D.	ppm
3)	Methane (TCD)	4.070f	88282	782.730	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.044	5189849	539.759	ppm
7)	Ethylene	1.573	10007759	590.286	ppm
8)	Ethane	1.822	10048964	583.213	ppm
9)	Propylene	4.160	13569343	562.612	ppm
10)	Propane	4.300	15251326	615.171	ppm
11)	Isobutylene	6.143	9815	NoCal	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

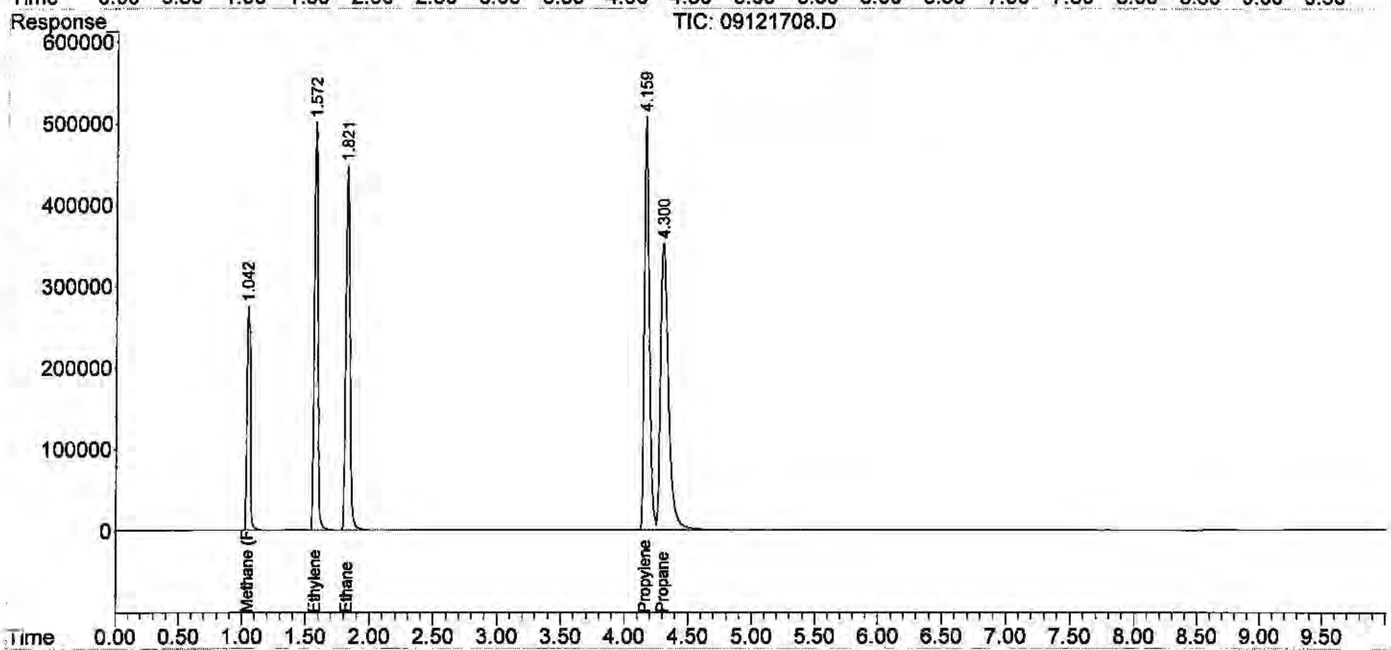
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121708.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 13:00
Operator  : MC
Sample    : 600ppm 0.3ml s32-09121701
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:10:57 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:10:50 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                    Signal #2 Phase:
Signal #1 Info  :                    Signal #2 Info :
```





Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121709.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 13:47
Operator : MC
Sample : 1000ppm 0.5ml s32-09121701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:11:46 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:11:38 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

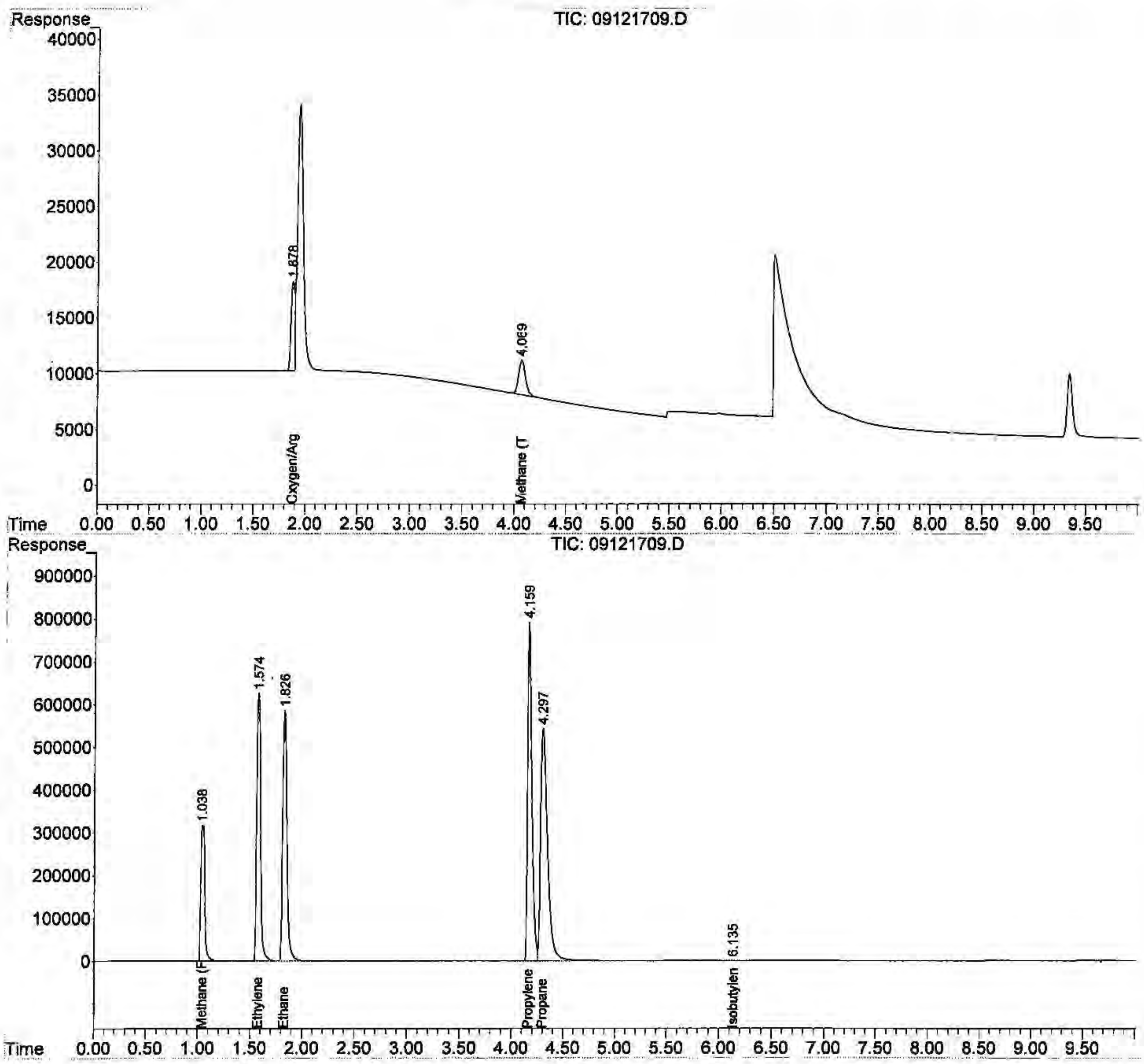
	Compound	R.T.	Response	Conc	Units
Target Compounds					
1)	Oxygen/Argon	1.879	192611	0.162	ppm
2)	Carbon monoxide	1.879	192611	N.D.	ppm
3)	Methane (TCD)	4.070f	145492	1244.729	ppm
4)	Carbon dioxide	0.000	0	N.D.	ppm
6)	Methane (FID)	1.039	8598534	945.644	ppm
7)	Ethylene	1.576	16608504	981.887	ppm
8)	Ethane	1.827	16709165	973.644	ppm
9)	Propylene	4.161	22494888	941.060	ppm
10)	Propane	4.298	25459411	1023.223	ppm
11)	Isobutylene	6.138	16970	8645.243	ppm
12)	Isobutane	0.000	0	N.D.	ppm
13)	n-Butane	0.000	0	N.D.	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121709.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 13:47
Operator : MC
Sample : 1000ppm 0.5ml s32-09121701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:11:46 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:11:38 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121710.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 14:07
Operator  : MC
Sample    : 2000ppm 1ml s32-09121701
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:12:33 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:12:25 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.       :
Signal #1 Phase :                Signal #2 Phase:
Signal #1 Info  :                Signal #2 Info :
```

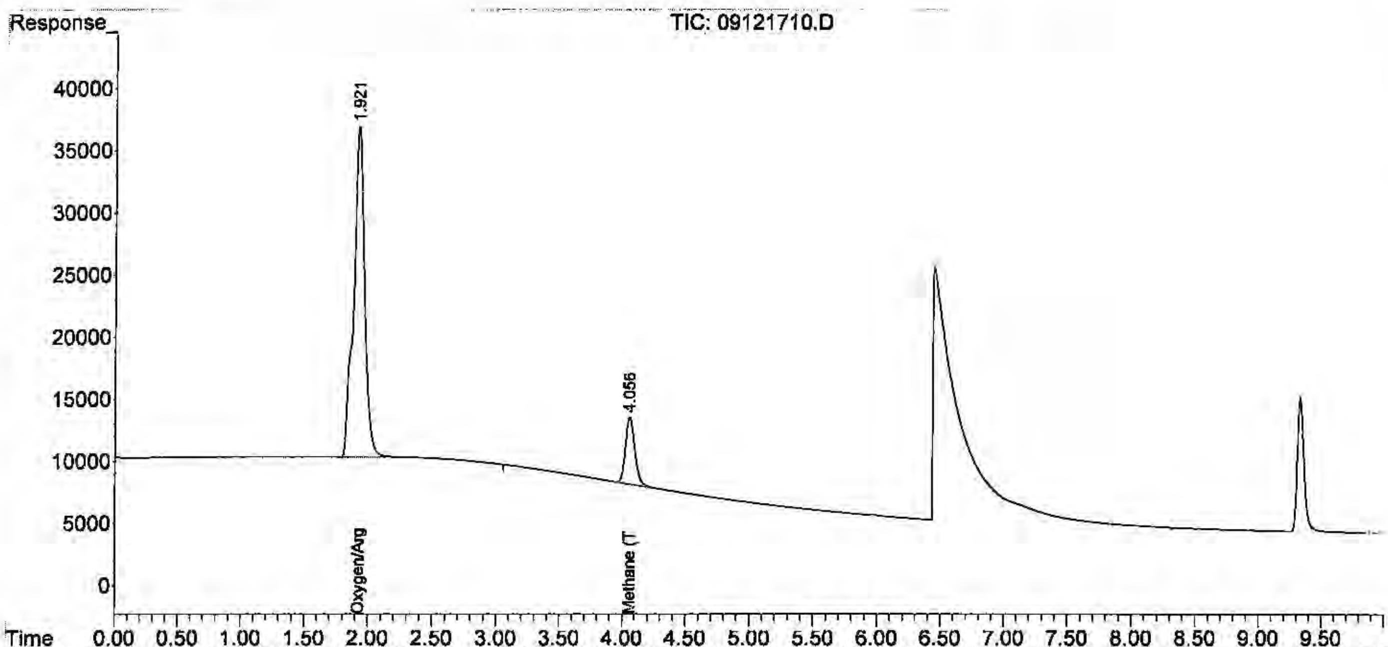
	Compound	R.T.	Response	Conc Units	
Target Compounds					
1)	Oxygen/Argon	1.922f	1578147	1.659 ppm	
2)	Carbon monoxide	1.922f	1578147	N.D. ppm	
3)	Methane (TCD)	4.057f	281651	3526.607 ppm	
4)	Carbon dioxide	0.000	0	N.D. ppm	
6)	Methane (FID)	1.016	16098209	1763.622 ppm	
7)	Ethylene	1.552	31192444	1848.268 ppm	
8)	Ethane	1.801	31424218	1837.143 ppm	
9)	Propylene	4.129	42124690	1775.341 ppm	m
10)	Propane	4.269	48583085	1946.921 ppm	
11)	Isobutylene	6.136	33832	25613.603 ppm	
12)	Isobutane	6.576f	3845	0.120 ppm	
13)	n-Butane	6.576f	3845	0.120 ppm	

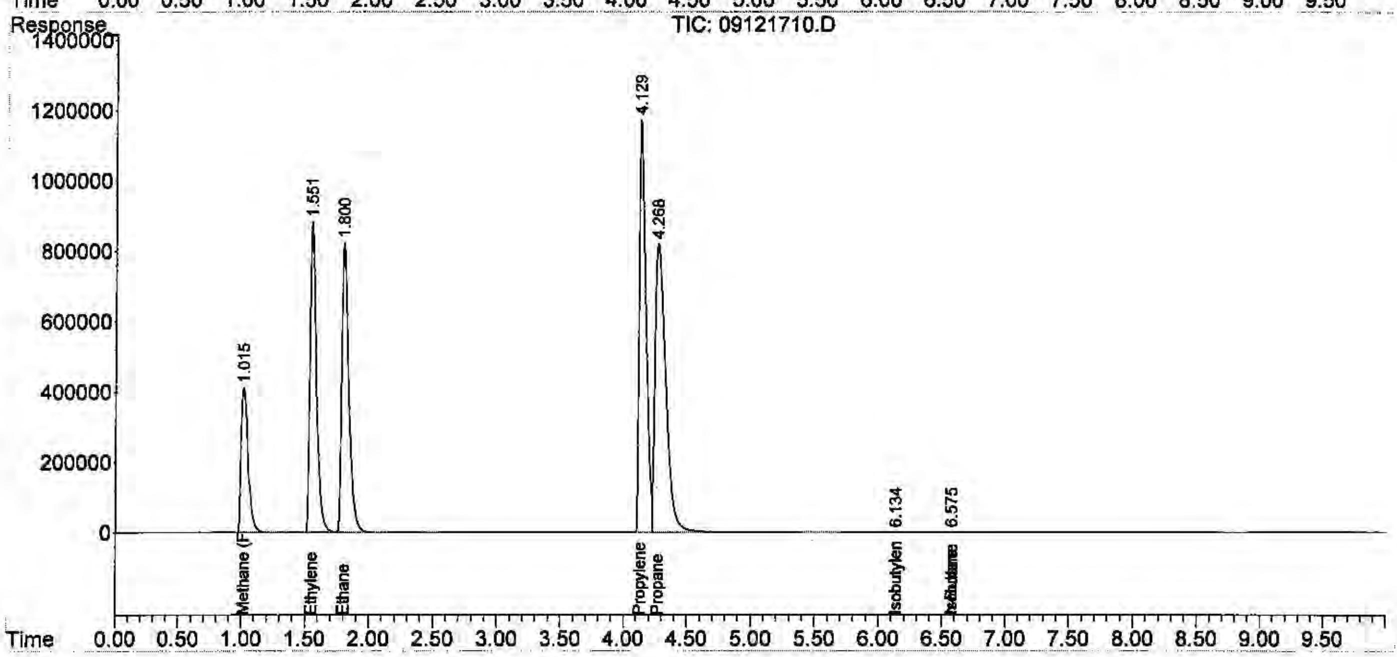
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121710.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 14:07
Operator  : MC
Sample    : 2000ppm 1ml s32-09121701
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:12:33 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:12:25 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.     :
Signal #1 Phase :                  Signal #2 Phase:
Signal #1 Info  :                  Signal #2 Info :
```





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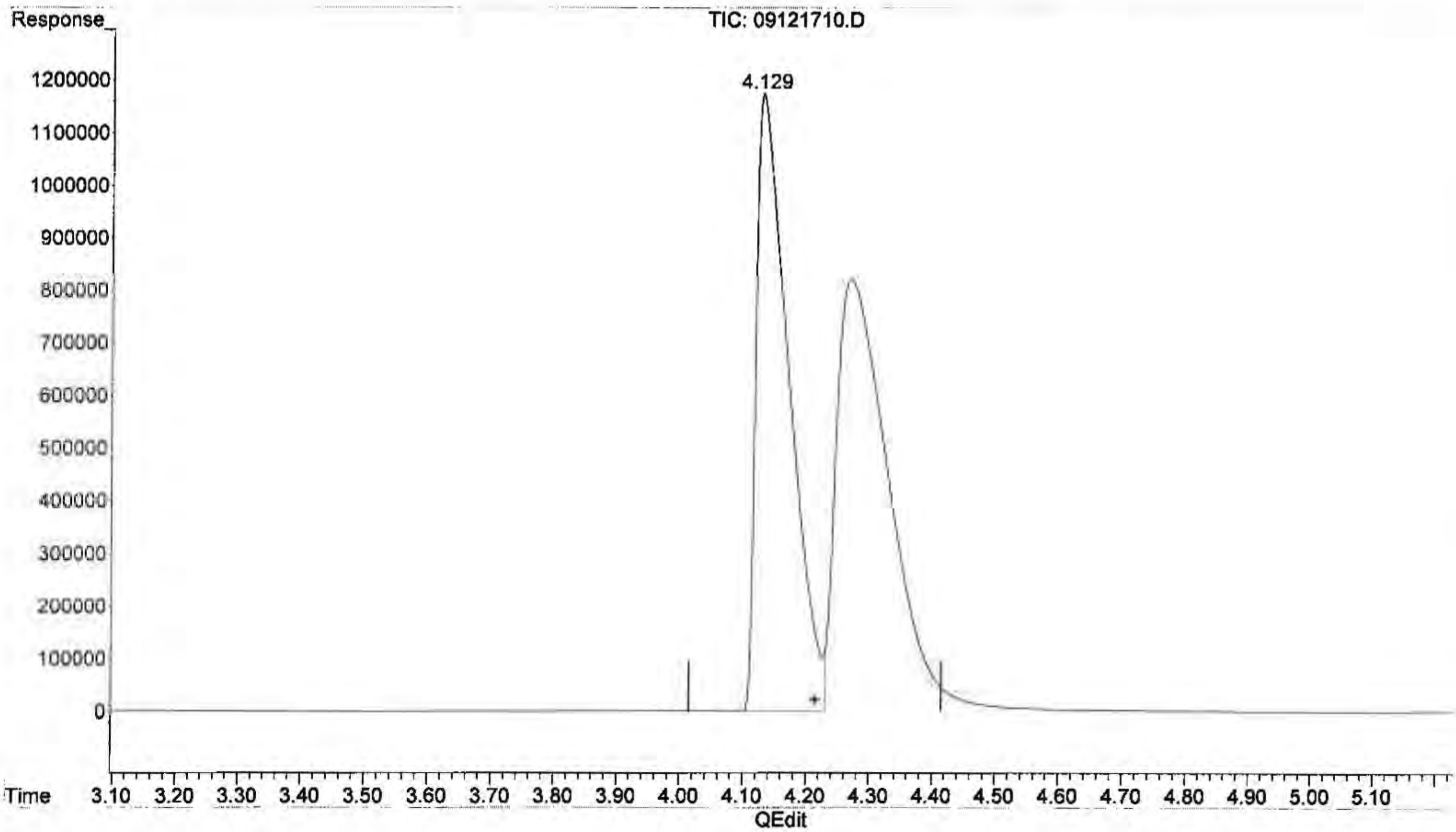
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121710.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 14:07
Operator : MC
Sample : 2000ppm 1ml s32-09121701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:12:33 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:12:25 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



(9) Propylene
4.129min 1775.341 ppm m
response 42124690

MC 9/13/17 MO
wp

(+) = Expected Retention Time
RS091217_R.M Wed Sep 13 15:08:03 2017

Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121711.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 14:48
Operator : MC
Sample : 4000ppm 0.1ml s32-08231701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:13:37 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:13:29 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

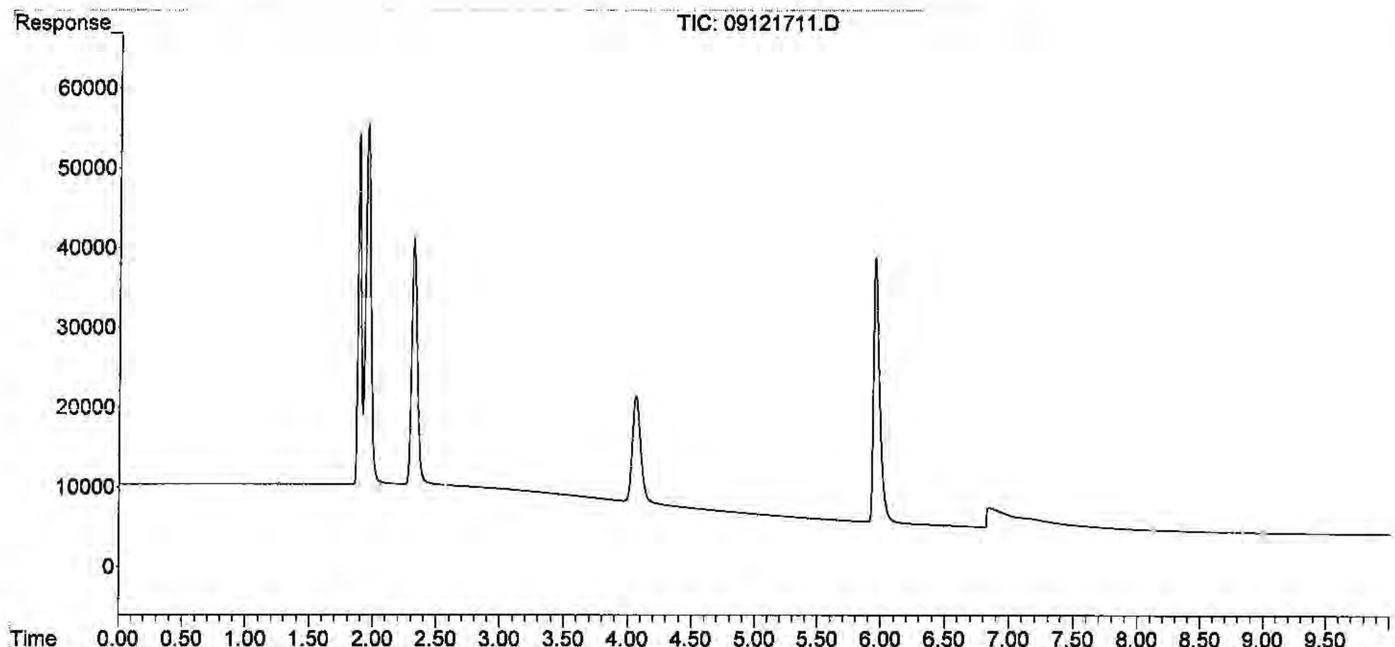
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	0.000	0	N.D.	ppm	d
2)	Carbon monoxide	0.000	0	N.D.	ppm	d
3)	Methane (TCD)	0.000	0	N.D.	ppm	d
4)	Carbon dioxide	0.000	0	N.D.	ppm	d
6)	Methane (FID)	1.059	35776839	3925.122	ppm	
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

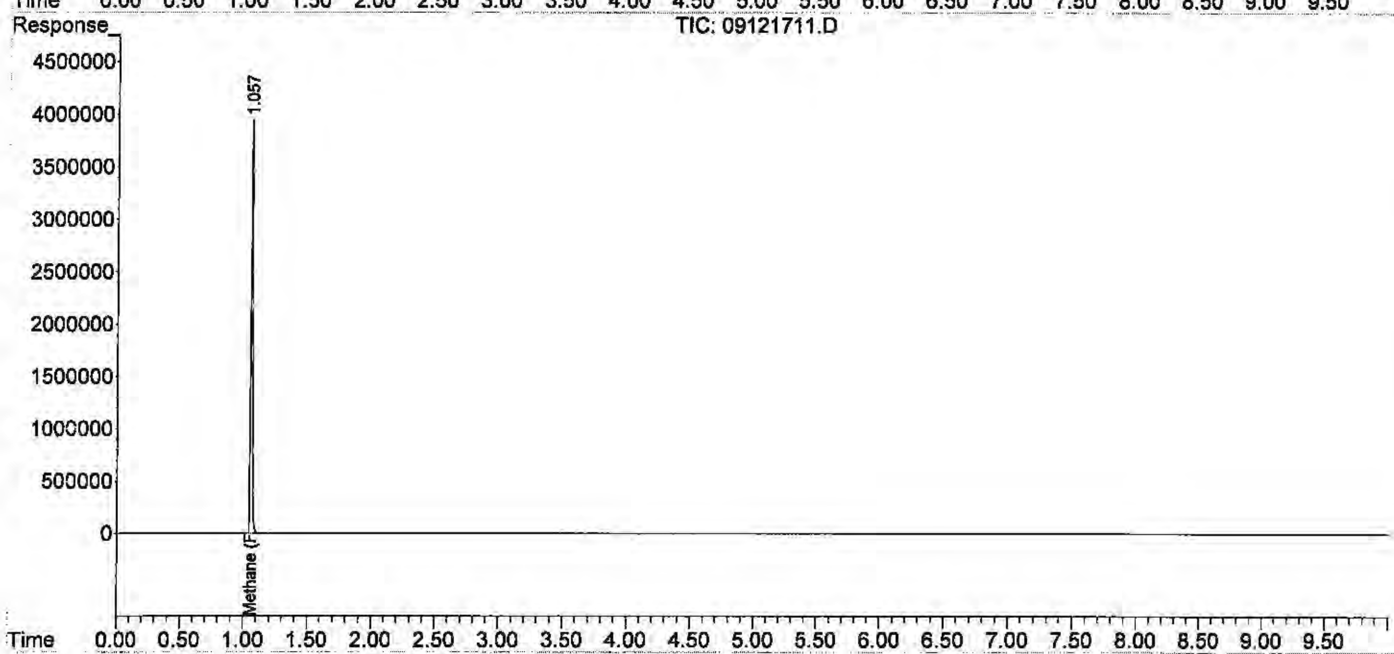
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121711.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 14:48
Operator : MC
Sample : 4000ppm 0.1ml s32-08231701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:13:37 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:13:29 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121712.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 15:21
Operator : MC
Sample : 20000ppm 0.5ml s32-08231701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:14:17 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:13:29 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

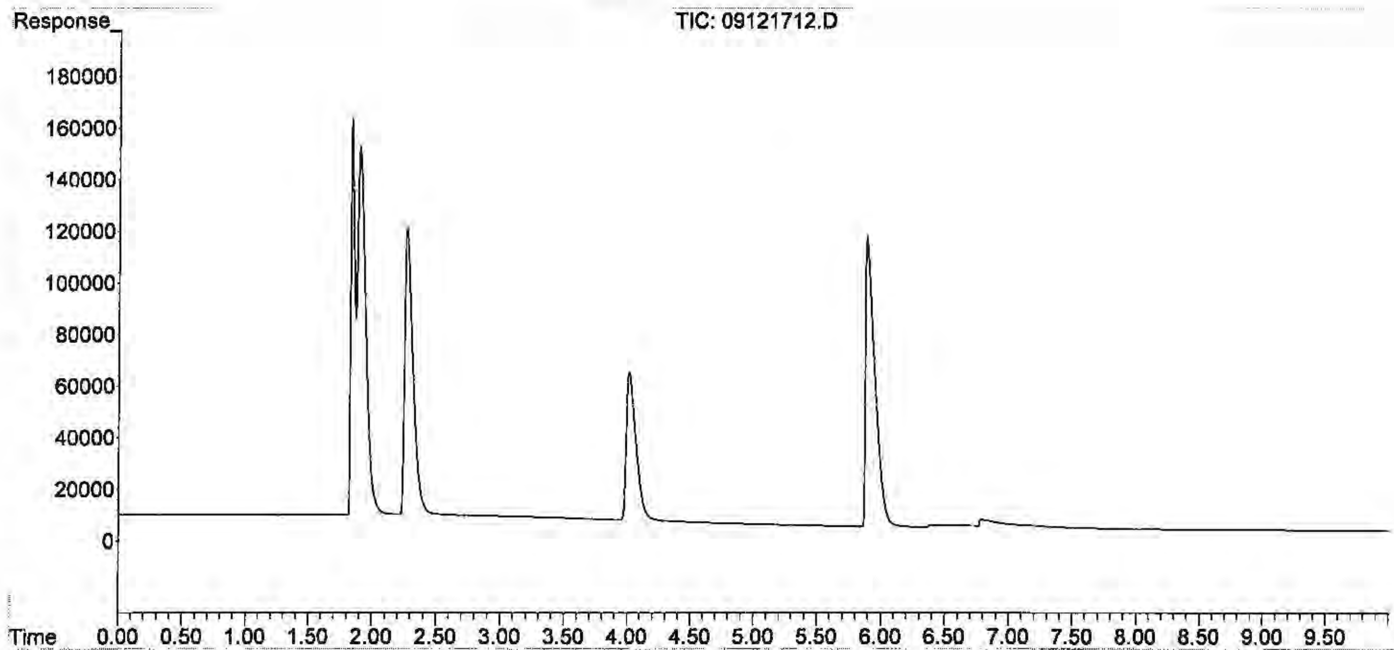
	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1)	Oxygen/Argon	0.000	0	N.D.	ppm	d
2)	Carbon monoxide	1.836	3190788	N.D.	ppm	
3)	Methane (TCD)	0.000	0	N.D.	ppm	d
4)	Carbon dioxide	0.000	0	N.D.	ppm	d
6)	Methane (FID)	1.034	169009160	18492.064	ppm	
7)	Ethylene	0.000	0	N.D.	ppm	
8)	Ethane	0.000	0	N.D.	ppm	
9)	Propylene	0.000	0	N.D.	ppm	
10)	Propane	0.000	0	N.D.	ppm	
11)	Isobutylene	0.000	0	N.D.	ppm	
12)	Isobutane	0.000	0	N.D.	ppm	
13)	n-Butane	0.000	0	N.D.	ppm	

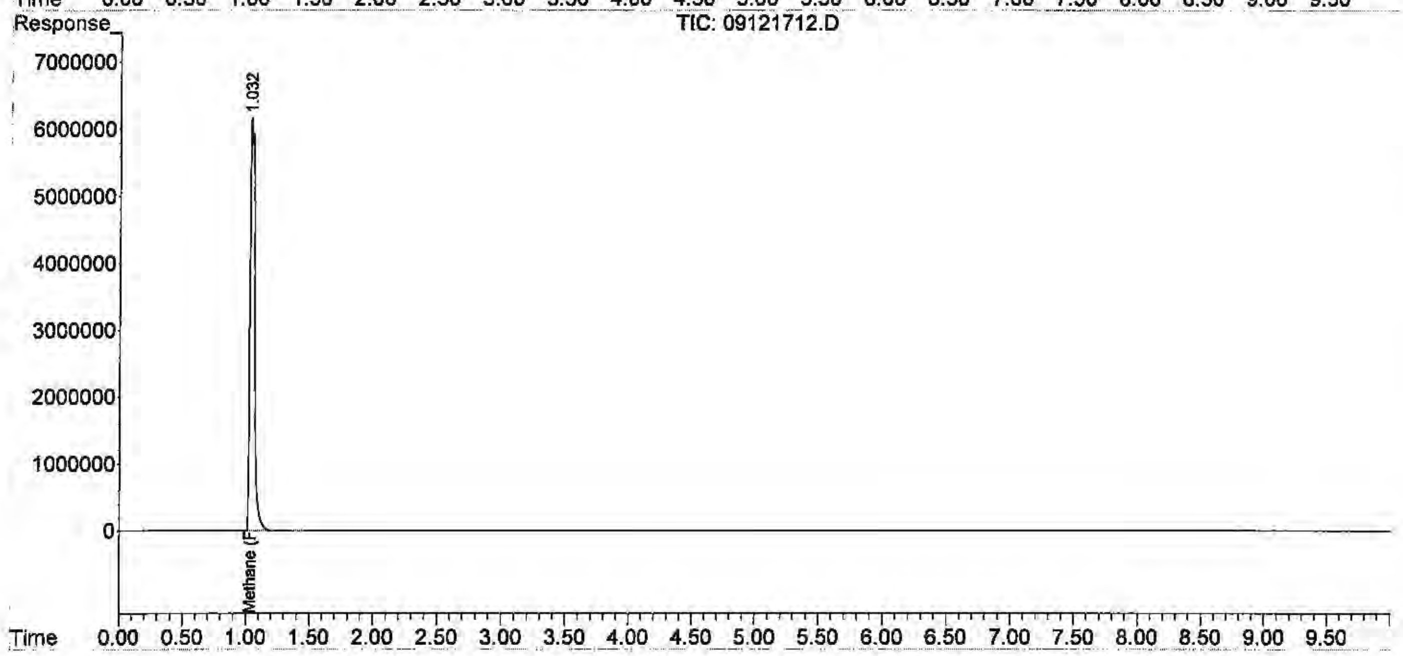
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121712.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 15:21
Operator : MC
Sample : 20000ppm 0.5ml s32-08231701
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:14:17 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:13:29 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





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Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121715.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 12-Sep-2017, 16:15
Operator : MC
Sample : icv s30-05241604
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:15:11 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:13:29 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

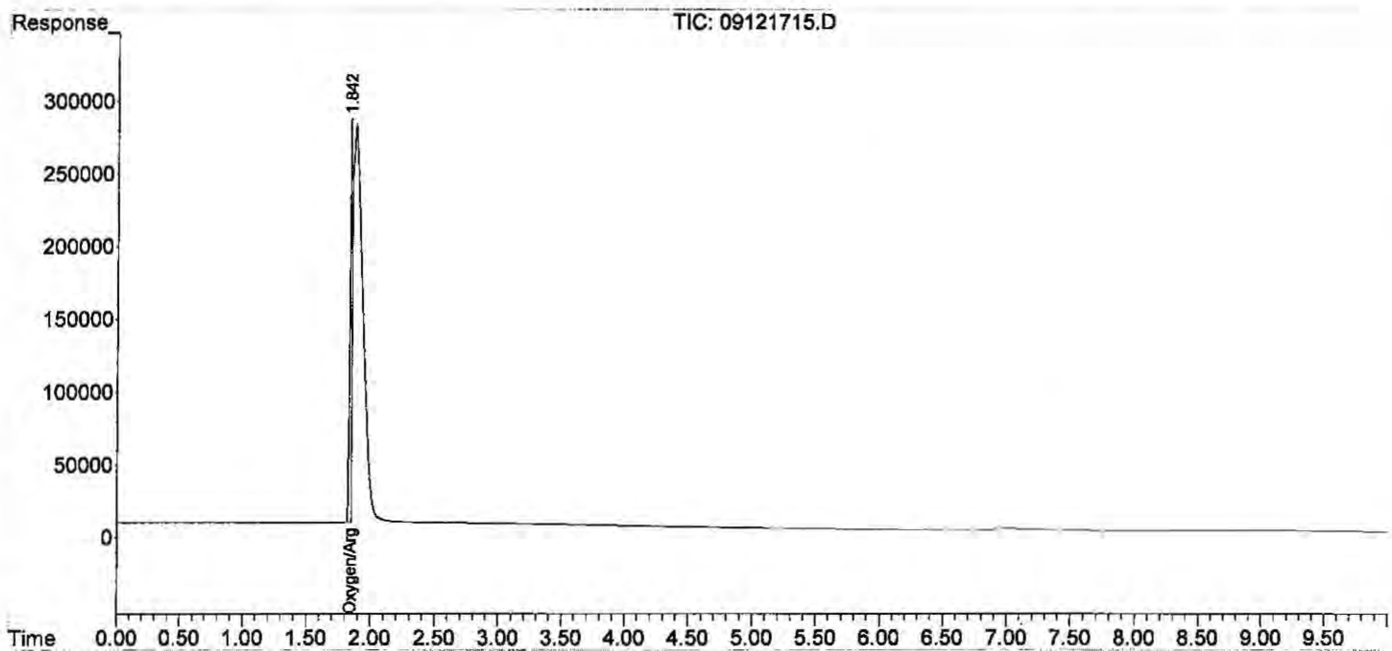
	Compound	R.T.	Response	Conc	Units	actual	%D
	Target Compounds						
1)	Oxygen/Argon	1.843	2922459	3.687	ppm		
2)	Carbon monoxide	1.843	2922459	N.D.	ppm		
3)	Methane (TCD)	0.000	0	N.D.	ppm		
4)	Carbon dioxide	0.000	0	N.D.	ppm		
6)	Methane (FID)	1.063	13748	1.516	ppm	1.50	101.1
7)	Ethylene	1.598	24153	1.443	ppm	1.50	96.2
8)	Ethane	1.850	24488	1.445	ppm	1.50	96.3
9)	Propylene	4.221	36004	1.537	ppm	1.50	102.5
10)	Propane	4.350	37738	1.517	ppm	1.51	100.5
11)	Isobutylene	0.000	0	N.D.	ppm		
12)	Isobutane	6.579f	48019	1.804	ppm		
13)	n-Butane	6.579f	48019	1.804	ppm		

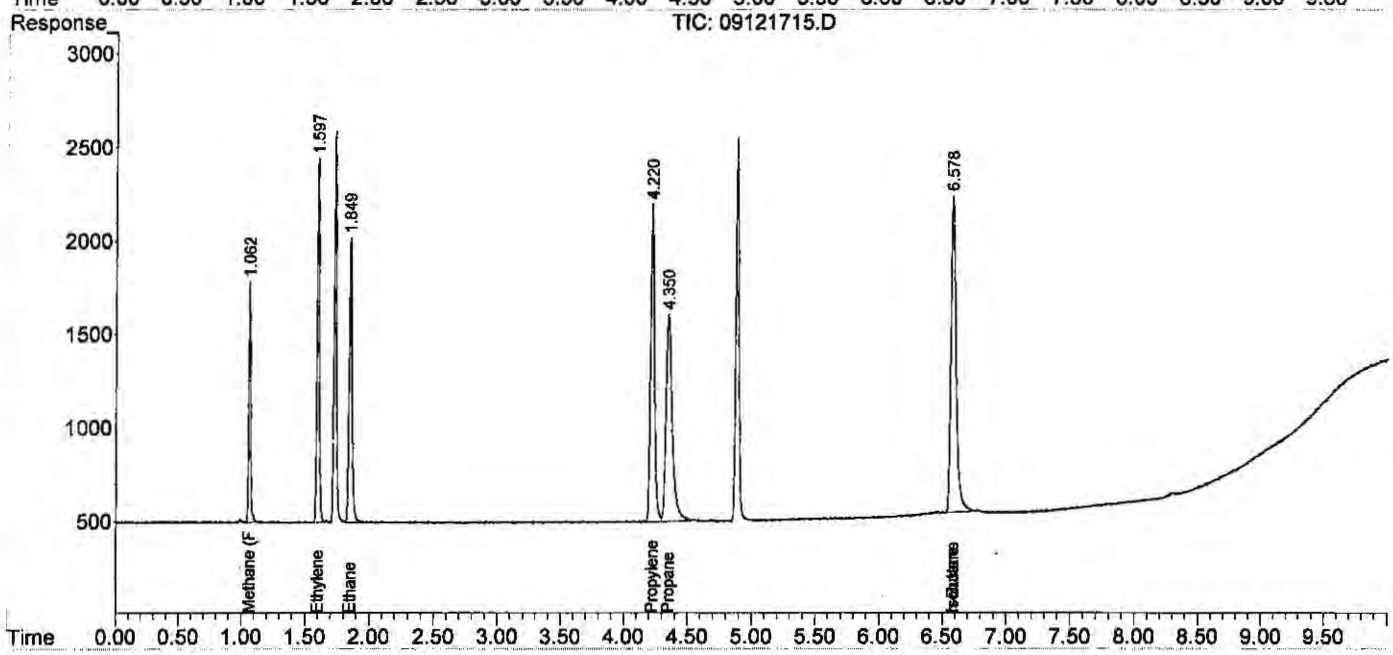
(f)=RT Delta > 1/2 Window (m)=manual int.


```
Data Path : J:\GC10\DATA\RSK_FID\2017_09\12\
Data File : 09121715.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 12-Sep-2017, 16:15
Operator  : MC
Sample    : icv s30-05241604
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: Sep 13 11:15:11 2017
Quant Method : J:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:13:29 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.       :
Signal #1 Phase :                 Signal #2 Phase:
Signal #1 Info  :                 Signal #2 Info :
```





ALS Environmental

Method : RSK175 Headspace Method for Dissolved Hydrocarbon in Water by FID/TCD
Client : ALS Laboratory Group — Analyst : WH — Instrument : GC#10
Service Request: P1902518 — Date Analysis : 05/07/19 — Detector : FID#10, TCD#10
Sample Vol. (ml) : 32.00 ml — Head Space Vol.(ml) : 8.00 ml — Gas Constant : 24.05684 (20°C)

HEAD SPACE RESULT (ppm)

Sample ID	Inj. Vol.	Methane	Ethylene	Ethane
std s32-07231801	0.100	1.511	1.468	1.437
ACTUAL		1.51	1.51	1.51
%Difference		0.1%	2.8%	4.8%
mcs 0.1ml	0.100	0.095	0.000	0.000
rb 0.1ml	0.100	0.000	0.000	0.000
fid lcs 0.1ml	0.100	1.422	0.993	1.221
fid lcsd 0.1ml	0.100	1.418	1.022	1.269
P1902518-001 0.1ml	0.100	0.071	0.000	0.000
P1902518-002 0.1ml	0.100	0.066	0.000	0.000
P1902518-003 0.1ml	0.100	1.328	0.000	0.000

FINAL HEAD SPACE RESULT (ppm)

	Methane	Ethylene	Ethane
WWt.	16.04	28.05	30.07
HENRY'S CONSTANT	3.76E+04	1.02E+04	2.63E+04
RL	1.30	1.00	0.60
mcs 0.1ml	0.950	0.000	0.000
fid lcs 0.1ml	14.220	9.930	12.210
fid lcsd 0.1ml	14.180	10.220	12.690
P1902518-001 0.1ml	0.710	0.000	0.000
P1902518-002 0.1ml	0.660	0.000	0.000
P1902518-003 0.1ml	13.280	0.000	0.000

	Methane	Ethylene	Ethane
std s32-07231801	1.670	1.615	1.589
ACTUAL	1.51	1.51	1.51
%Difference	10.6%	7.0%	5.2%

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071901.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 11:16:44
Operator : WH
Sample : std s32-07231801
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 11:42:41 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

	Compound	R.T.	Response	Conc Units
Target Compounds				
1)	Oxygen/Argon	0.000	0	N.D. ppm
2)	Carbon monoxide	0.000	0	N.D. ppm
3)	Methane (TCD)	0.000	0	N.D. ppm
4)	Carbon dioxide	0.000	0	N.D. ppm
6)	Methane (FID)	1.111	13706	1.511 ppm
7)	Ethylene	1.673	24571	1.468 ppm
8)	Ethane	1.935	24353	1.437 ppm
9)	Propylene	4.313	33703	1.438 ppm
10)	Propane	4.436	34957	1.405 ppm
11)	Isobutylene	0.000	0	N.D. ppm
12)	Isobutane	6.650	43683	1.641 ppm
13)	n-Butane	6.650	43683	1.641 ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

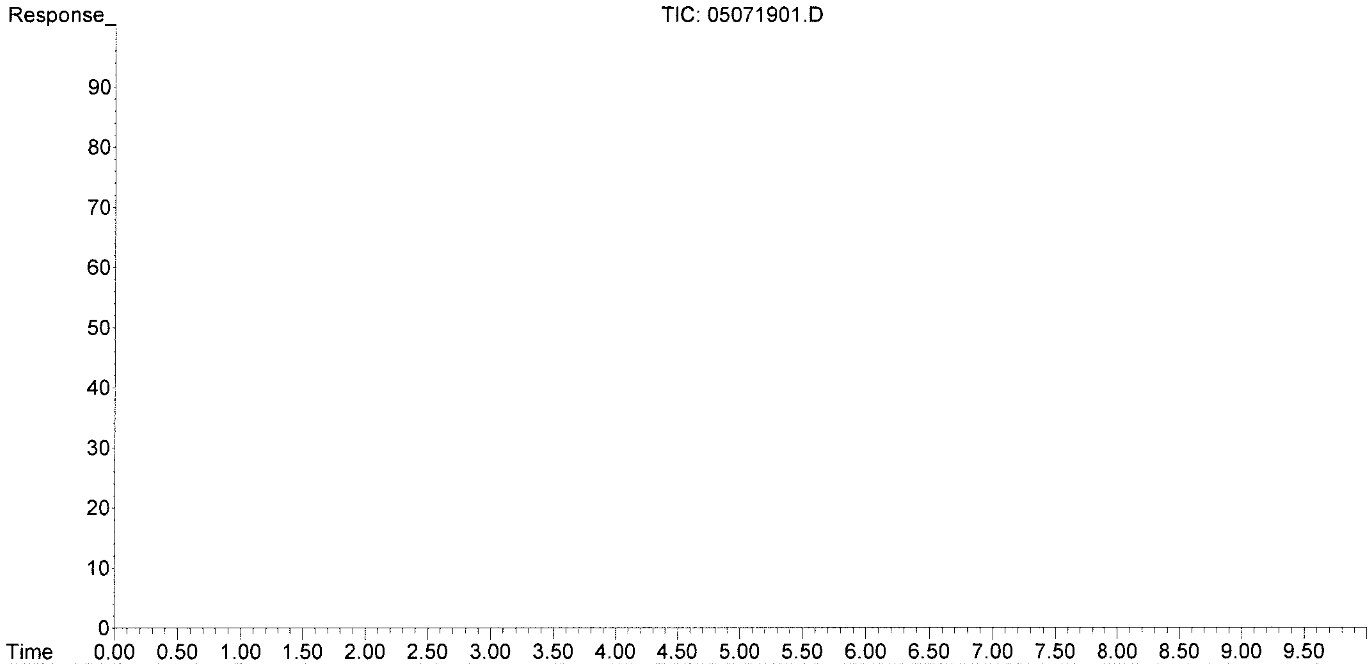
WH 5/11/19

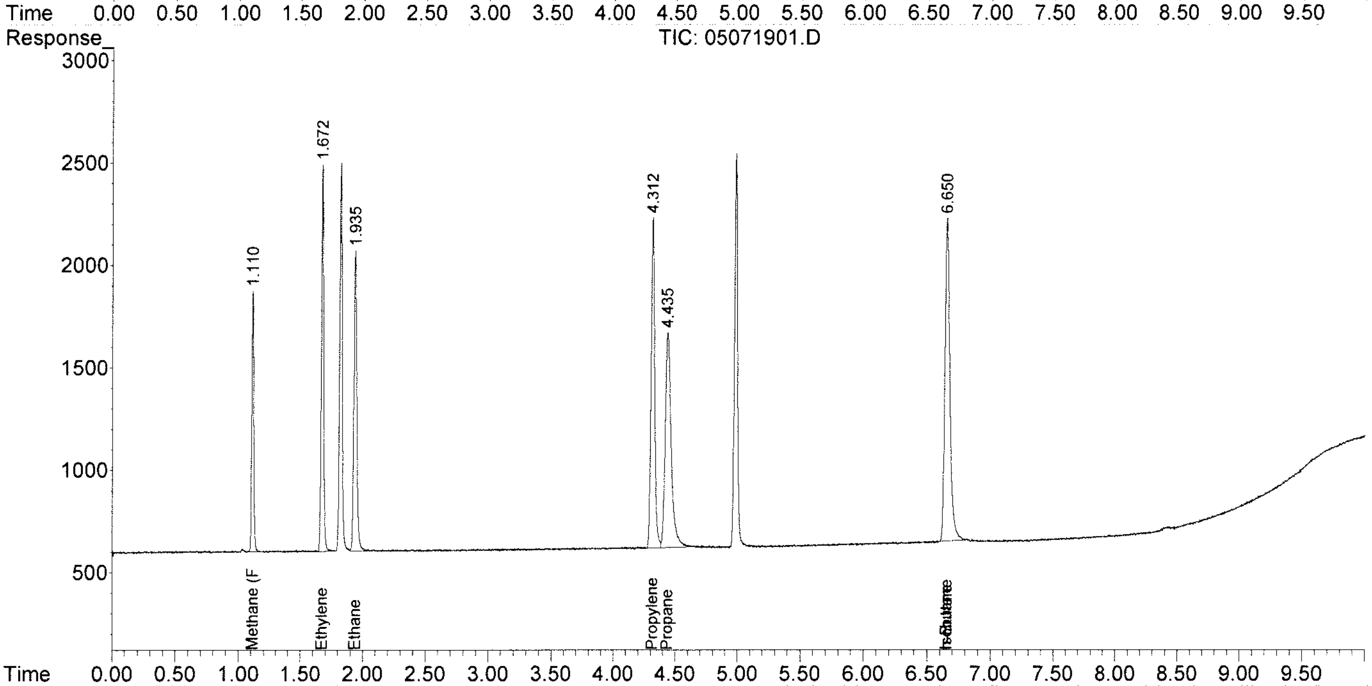
00954942

Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071901.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 11:16:44
Operator : WH
Sample : std s32-07231801
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 11:42:41 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071914.D
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH
Acq On : 07-May-2019, 16:10:13
Operator : WH
Sample : std s32-07231801
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 16:37:30 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :

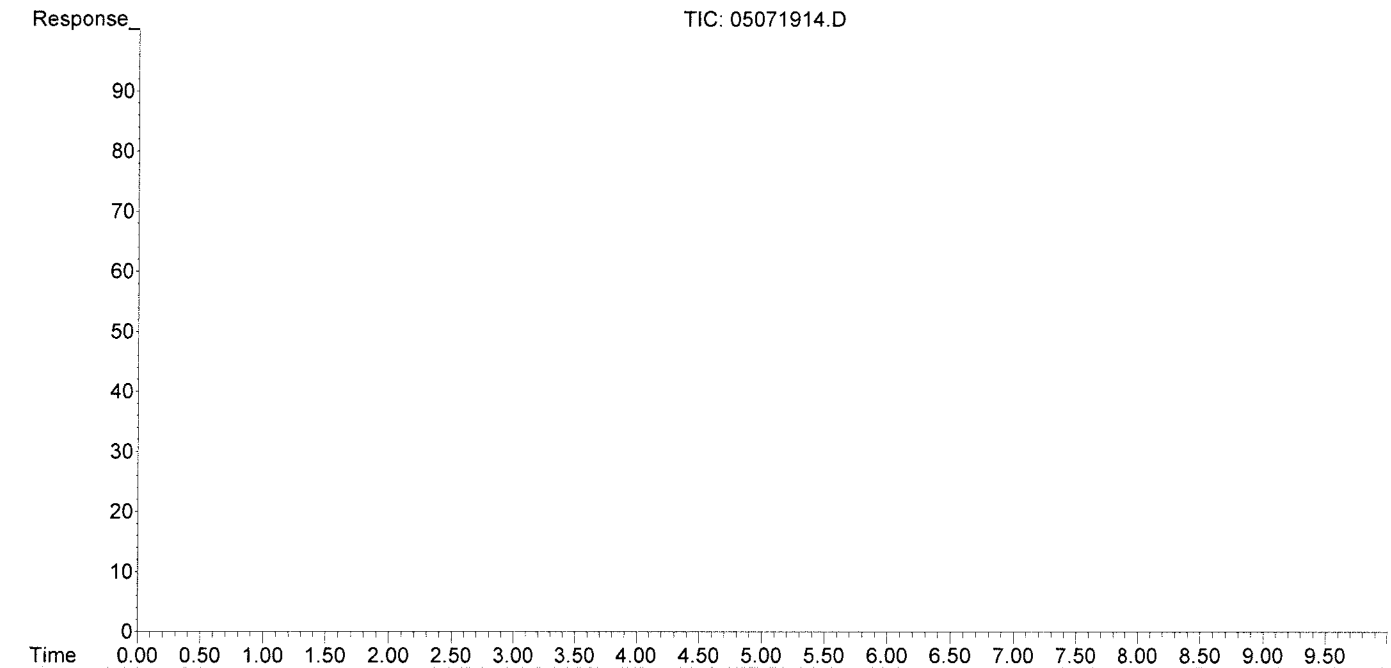
	Compound	R.T.	Response	Conc Units
Target Compounds				
1)	Oxygen/Argon	0.000	0	N.D. ppm
2)	Carbon monoxide	0.000	0	N.D. ppm
3)	Methane (TCD)	0.000	0	N.D. ppm
4)	Carbon dioxide	0.000	0	N.D. ppm
6)	Methane (FID)	1.083	15146	1.670 ppm
7)	Ethylene	1.646	27029	1.615 ppm
8)	Ethane	1.909	26933	1.589 ppm
9)	Propylene	4.306	37901	1.618 ppm
10)	Propane	4.431	39325	1.581 ppm
11)	Isobutylene	0.000	0	N.D. ppm
12)	Isobutane	6.651	50413	1.894 ppm
13)	n-Butane	6.651	50413	1.894 ppm

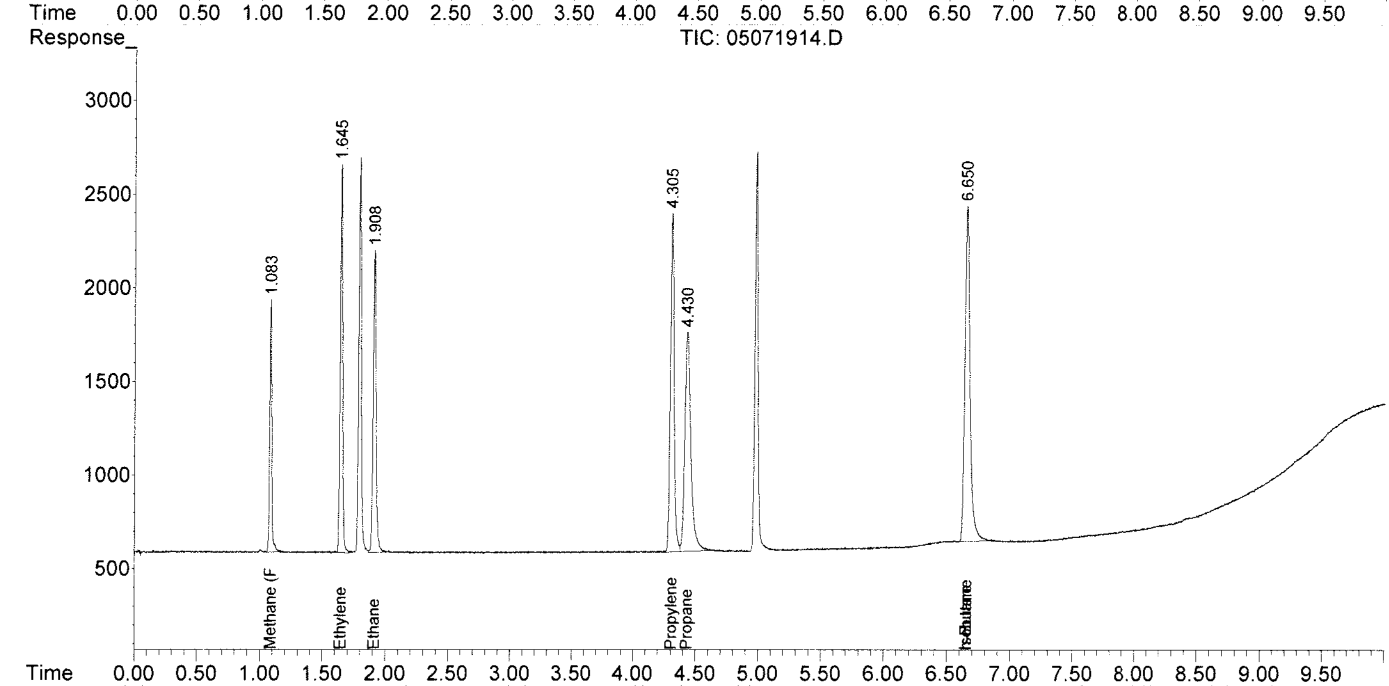
(f)=RT Delta > 1/2 Window (m)=manual int.

```
Data Path : J:\GC10\DATA\RSK_FID\2019_05\07\
Data File : 05071914.D
Signal(s) : Signal #1: TCD1A.CH  Signal #2: FID2B.CH
Acq On    : 07-May-2019, 16:10:13
Operator  : WH
Sample    : std s32-07231801
Misc      :
ALS Vial  : 1   Sample Multiplier: 1

Integration File signal 1: autoint1.e
Integration File signal 2: autoint2.e
Quant Time: May 07 16:37:30 2019
Quant Method : I:\GC10\METHODS\RS091217_R.M
Quant Title  : RSK175, VOA-DISGAS, VOA-TO3C1C6
QLast Update : Wed Sep 13 11:14:47 2017
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.      :
Signal #1 Phase  :                    Signal #2 Phase:
Signal #1 Info   :                    Signal #2 Info :
```





Injection Log

Directory: I:\GC10\DATA\RSK_FID\2017_09\12\

	Date/Time	File Name	Sample ID	Misc Info	Operator	Acquisition Method	Comments
1	12-Sep-17, 08:38:08	09121701.D	test		MC	RSKBOTH.M	
2	12-Sep-17, 10:52:40	09121702.D	0.151ppm 0.250ml s32-09121702		MC	RSKBOTH.M	Curve
3	12-Sep-17, 11:05:49	09121703.D	0.302ppm 0.5ml s32-09121702		MC	RSKBOTH.M	Curve
4	12-Sep-17, 11:45:34	09121704.D	1.51ppm 0.1ml s32-09051701		MC	RSKBOTH.M	Curve
5	12-Sep-17, 12:09:33	09121705.D	4.53ppm 0.3ml s32-09051701		MC	RSKBOTH.M	Curve
6	12-Sep-17, 12:30:23	09121706.D	10.57ppm 0.7ml s32-09051701		MC	RSKBOTH.M	Curve
7	12-Sep-17, 12:47:18	09121707.D	200ppm 0.1ml s32-09121701		MC	RSKBOTH.M	Curve
8	12-Sep-17, 13:00:22	09121708.D	600ppm 0.3ml s32-09121701		MC	RSKBOTH.M	Curve
9	12-Sep-17, 13:47:48	09121709.D	1000ppm 0.5ml s32-09121701		MC	RSKBOTH.M	Curve
10	12-Sep-17, 14:07:58	09121710.D	2000ppm 1ml s32-09121701		MC	RSKBOTH.M	Curve
11	12-Sep-17, 14:48:48	09121711.D	4000ppm 0.1ml s32-08231701		MC	RSKBOTH.M	Curve
12	12-Sep-17, 15:21:51	09121712.D	20000ppm 0.5ml s32-08231701		MC	RSKBOTH.M	Curve
13	12-Sep-17, 15:38:59	09121713.D	mb 0.5ml		MC	RSKBOTH.M	Pass
14	12-Sep-17, 15:55:35	09121714.D	mb 0.1ml		MC	RSKBOTH.M	Pass
15	12-Sep-17, 16:15:26	09121715.D	icv s30-05241604		MC	RSKBOTH.M	Pass

Injection Log

Directory: I:\GC10\DATA\RSK_FID\2019_05\07\

	Date/Time	File Name	Sample ID	Misc Info	Operator	Acquisition Method	Comments
1	07-May-19, 11:16:44	05071901.D	std s32-07231801		WH	RSKBOTH.M	pass
2	07-May-19, 11:45:26	05071902.D	rb 0.1ml		WH	RSKBOTH.M	pass
3	07-May-19, 12:01:04	05071903.D	mcs 0.1ml		WH	RSKBOTH.M	pass
4	07-May-19, 12:38:57	05071904.D	fid lcs 0.1ml		WH	RSKBOTH.M	pass
5	07-May-19, 13:13:46	05071905.D	fid lcsd 0.1ml		WH	RSKBOTH.M	pass
6	07-May-19, 13:37:00	05071906.D	K1903690-013 0.1ml		WH	RSKBOTH.M	
7	07-May-19, 13:52:43	05071907.D	K1903690-014 0.1ml		WH	RSKBOTH.M	
8	07-May-19, 14:39:40	05071908.D	K1903690-015 0.1ml		WH	RSKBOTH.M	
9	07-May-19, 14:57:15	05071909.D	K1903690-016 0.1ml		WH	RSKBOTH.M	
10	07-May-19, 15:09:31	05071910.D	K1903690-017 0.1ml		WH	RSKBOTH.M	
11	07-May-19, 15:22:32	05071911.D	P1902518-001 0.1ml		WH	RSKBOTH.M	
12	07-May-19, 15:42:23	05071912.D	P1902518-002 0.1ml		WH	RSKBOTH.M	
13	07-May-19, 15:55:45	05071913.D	P1902518-003 0.1ml		WH	RSKBOTH.M	
14	07-May-19, 16:10:13	05071914.D	std s32-07231801		WH	RSKBOTH.M	pass

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : 1 360 577 7222
F : 1 360 636 1068
www.alsglobal.com

May 13, 2019

Analytical Report for Service Request No: K1903966

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

RE: HS19050082

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory May 03, 2019
For your reference, these analyses have been assigned our service request number **K1903966.**

Analyses were performed according to our laboratory s NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) 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.

Please contact me if you have any questions. My extension is 3350. You may also contact me via email at Kelley.Lovejoy@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

for Kelley Lovejoy
Project Manager

ALS Environmental
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Kelso, WA 98626
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Table of Contents

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
LOD	Limit of Detection
LOQ	Limit of Quantitation
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.

Inorganic Data Qualifiers

- ***** The result is an outlier. See case narrative.
- **#** The control limit criteria is not applicable. See case narrative.
- **B** The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- **E** The result is an estimate amount because the value exceeded the instrument calibration range.
- **J** The result is an estimated value.
- **U** The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
  DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- **i** The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- **X** See case narrative.
- **Q** See case narrative. One or more quality control criteria was outside the limits.
- **H** The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- **#** The control limit criteria is not applicable. See case narrative.
- **J** The result is an estimated value.
- **E** The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- **M** The duplicate injection precision was not met.
- **N** The Matrix Spike sample recovery is not within control limits. See case narrative.
- **S** The reported value was determined by the Method of Standard Additions (MSA).
- **U** The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
  DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- **W** The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- **i** The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- **X** See case narrative.
- **+** The correlation coefficient for the MSA is less than 0.995.
- **Q** See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- ***** The result is an outlier. See case narrative.
- **#** The control limit criteria is not applicable. See case narrative.
- **A** A tentatively identified compound, a suspected aldol-condensation product.
- **B** The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- **C** The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- **D** The reported result is from a dilution.
- **E** The result is an estimated value.
- **J** The result is an estimated value.
- **N** The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- **P** The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- **U** The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
  DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- **i** The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- **X** See case narrative.
- **Q** See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- **F** The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- **L** The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- **H** The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- **O** The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- **Y** The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- **Z** The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
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ALS Environmental

Client: ALS Environmental - US
Project: HS19050082
Sample Matrix: Ground Water

Service Request: K1903966
Date Received: 05/03/2019

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier level IV requested by the client.

Sample Receipt:

Three ground water samples were received for analysis at ALS Environmental on 05/03/2019. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by ____________________ Date 05/13/2019

Chain of Custody

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K1903966

Subcontract Chain of Custody

SAMPLING STATE: **Texas** **COC ID: 11238**

SUBCONTRACT TO:

ALS Environmental Kelso
1317 S. 13th Avenue
Kelso, WA 98626 **Phone:** +1 360 501 3312

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: HS19050082
TSR: Sonia West

	LAB SAMPLE ID / ANALYSIS REQUESTED	CLIENT SAMPLE ID	MATRIX	COLLECT DATE / DUE DATE
1.	**HS19050082-01**	**67WW13-190501**	**Groundwater**	**01 May 2019 08:00**
	TOC Analysis with DOD Level IV/EQuIS APTIM EDD			16 May 2019
2.	**HS19050082-02**	**67WW13-190501 FD**	**Groundwater**	**01 May 2019 08:00**
	TOC Analysis with DOD Level IV/EQuIS APTIM EDD			16 May 2019
3.	**HS19050082-03**	**67WW08-190501**	**Groundwater**	**01 May 2019 08:00**
	TOC Analysis with DOD Level IV/EQuIS APTIM EDD			16 May 2019

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

QC Level: DOD IV (DoD Data Package)

Relinquished By: Date/Time: 5/2/19 1800

Received By: K Morrow ALS-Kelso Date/Time: 5/3/19 10:10

Cooler ID(s): Temperature(s):

00954956

PC KL

Cooler Receipt and Preservation Form

Client ALS-Houston Service Request K19 03966

Received: 5/3/19 Opened: 5/3/19 By: KM Unloaded: 5/3/19 By: Kr

1. Samples were received via? USPS **Fed Ex** UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) **Cooler** Box Envelope Other ____ NA
3. Were custody seals on coolers? NA **Y** N If yes, how many and where? 2 Front
   If present, were custody seals intact? **Y** N If present, were they signed and dated? **Y** N

Raw Cooler Temp	Corrected. Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-0.3	-0.1	2.0	2.2	+0.2	379	11238	480978334533	

4. Packing material: Inserts **Baggies** **Bubble Wrap** Gel Packs **Wet Ice** Dry Ice Sleeves ____
5. Were custody papers properly filled out (ink, signed, etc.)? NA **Y** N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA **Y** N
   If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA **Y** N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA **Y** N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA **Y** N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA **Y** N
11. Were VOA vials received without headspace? *Indicate in the table below.* **NA** Y N
12. Was C12/Res negative? **NA** Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions:

General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: ALS Environmental - US
Project: HS19050082
Sample Matrix: Ground Water
Analysis Method: SM 5310 C
Prep Method: None

Service Request: K1903966
Date Collected: 05/1/19
Date Received: 05/3/19
Units: mg/L
Basis: NA

Carbon, Total Organic

Sample Name	Lab Code	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
67WW13-190501	K1903966-001	**2.91**	0.50	0.20	0.07	1	05/07/19 18:56	
67WW13-190501 FD	K1903966-002	**3.24**	0.50	0.20	0.07	1	05/07/19 19:53	
67WW08-190501	K1903966-003	**2.09**	0.50	0.20	0.07	1	05/07/19 20:21	
Method Blank	K1903966-MB	ND U	0.50	0.20	0.07	1	05/07/19 15:50	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1903966
Project	HS19050082	**Date Collected:**	05/01/19
Sample Matrix:	Ground Water	**Date Received:**	05/03/19
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Carbon, Total Organic

Sample Name:	Lab Code:	LOQ	LOD	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
67WW13-190501	K1903966-001DUP	0.50	0.20	0.07	2.91	2.94	2.92	<1	10	05/07/19
67WW13-190501 FD	K1903966-002DUP	0.50	0.20	0.07	3.24	3.06	3.15	6	10	05/07/19
67WW08-190501	K1903966-003DUP	0.50	0.20	0.07	2.09	1.97	2.03	6	10	05/07/19

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.

Printed 5/13/2019 10:53:49 AM Superset Reference:19-0000507564 rev 00

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1903966
Project:	HS19050082	**Date Analyzed:**	05/07/19
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	634658

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1903966-LCS	25.3	25.0	101	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1903966
Project: HS19050082

Continuing Calibration Verification (CCV) Summary

Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	634658	KQ1906023-04	05/07/19 15:21	25.0	25.1	100	90-110
CCV2	634658	KQ1906023-05	05/07/19 19:24	25.0	25.6	102	90-110
CCV3	634658	KQ1906023-06	05/08/19 00:34	25.0	24.8	99	90-110

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1903966
Project: HS19050082

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	634658	KQ1906023-01	05/07/19 15:36	0.50	0.20	0.07	ND	U
CCB2	634658	KQ1906023-02	05/07/19 19:38	0.50	0.20	0.07	ND	U
CCB3	634658	KQ1906023-03	05/08/19 00:49	0.50	0.20	0.07	ND	U

Raw Data

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General Chemistry

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Work Request # Original (________) KH03899, 3947, 3763, 3889, 3965, 3966, 3997, 4006,

Tier: I II II II IV IV I I

Date Analyzed: 5/7/19

Analyst: BCD

Analysis: TOC/DOC

Run # TOC: 634658 DOC: 634659

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA

COMMENTS:

Final Approved by: [signature] Date: 05/09/19

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 634658 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1903763-004	Carbon, Total Organic	N/A		Water	7.05 mg/L	10 mL	705 mg/L	100	7	50			5/7/19 23:10:00	N	II
K1903763-005	Carbon, Total Organic	N/A		Water	7.11 mg/L	10 mL	711 mg/L	100	7	50			5/7/19 23:38:00	N	II
K1903889-001	Carbon, Total Organic	N/A		Water	7.75 mg/L	10 mL	7.75 mg/L	1	0.07	0.50			5/7/19 21:46:00	N	II
K1903889-002	Carbon, Total Organic	N/A		Water	18.69 mg/L	10 mL	18.7 mg/L	1	0.07	0.50			5/7/19 22:14:00	N	II
K1903889-003	Carbon, Total Organic	N/A		Water	14.58 mg/L	10 mL	14.6 mg/L	1	0.07	0.50			5/7/19 22:42:00	N	II
K1903965-001	Carbon, Total Organic	N/A		Water	1.51 mg/L	10 mL	1.51 mg/L	1	0.07	0.50			5/7/19 17:30:00	N	IV
K1903966-001	Carbon, Total Organic	N/A		Ground Water	2.91 mg/L	10 mL	2.91 mg/L	1	0.07	0.50			5/7/19 18:56:00	N	IV
K1903966-002	Carbon, Total Organic	N/A		Ground Water	3.24 mg/L	10 mL	3.24 mg/L	1	0.07	0.50			5/7/19 19:53:00	N	IV
K1903966-003	Carbon, Total Organic	N/A		Ground Water	2.09 mg/L	10 mL	2.09 mg/L	1	0.07	0.50			5/7/19 20:21:00	N	IV
K1903997-002	Carbon, Total Organic	N/A		Drinking Water	0.23 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/7/19 18:28:00	N	I
K1904006-001	Carbon, Total Organic	N/A		Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/7/19 16:34:00	N	I
K1904006-002	Carbon, Total Organic	N/A		Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/7/19 17:02:00	N	I
KQ1906023-01	Carbon, Total Organic	CCB		Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/7/19 15:36:00	N	I
KQ1906023-02	Carbon, Total Organic	CCB		Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/7/19 19:38:00	N	I
KQ1906023-03	Carbon, Total Organic	CCB		Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/8/19 00:49:00	N	I
KQ1906023-04	Carbon, Total Organic	CCV		Reagent Water	25.09 mg/L	10 mL	25.1 mg/L	1					5/7/19 15:21:00	N	I
KQ1906023-05	Carbon, Total Organic	CCV		Reagent Water	25.59 mg/L	10 mL	25.6 mg/L	1					5/7/19 19:24:00	N	I
KQ1906023-06	Carbon, Total Organic	CCV		Reagent Water	24.77 mg/L	10 mL	24.8 mg/L	1					5/8/19 00:34:00	N	I
KQ1906023-07	Carbon, Total Organic	MB		Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/7/19 15:50:00	N	I
KQ1906023-08	Carbon, Total Organic	LCS		Reagent Water	25.33 mg/L	10 mL	25.3 mg/L	1	0.07	0.50	101		5/7/19 16:05:00	N	I
KQ1906023-09	Carbon, Total Organic	MS	K1903965-001	Water	27.53 mg/L	10 mL	27.5 mg/L	1	0.07	0.50	104		5/7/19 17:59:00	N	IV
KQ1906023-10	Carbon, Total Organic	DUP	K1904006-001	Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50		NC	5/7/19 16:34:00	N	I
KQ1906023-11	Carbon, Total Organic	DUP	K1904006-002	Reagent Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50		NC	5/7/19 17:02:00	N	I
KQ1906023-12	Carbon, Total Organic	DUP	K1903965-001	Water	1.53 mg/L	10 mL	1.53 mg/L	1	0.07	0.50		<1	5/7/19 17:30:00	N	IV
KQ1906023-13	Carbon, Total Organic	DUP	K1903997-002	Drinking Water	0.19 mg/L	10 mL	0.19 mg/L J	1	0.07	0.50		NC	5/7/19 18:28:00	N	I
KQ1906023-14	Carbon, Total Organic	DUP	K1903966-001	Ground Water	2.94 mg/L	10 mL	2.94 mg/L	1	0.07	0.50		<1	5/7/19 18:56:00	N	IV

05/09/19

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 634658 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1906023-15	Carbon, Total Organic	DUP	K1903966-002	Ground Water	3.06 mg/L	10 mL	3.06 mg/L	1	0.07	0.50		6	5/7/19 19:53:00	N	IV
KQ1906023-16	Carbon, Total Organic	DUP	K1903966-003	Ground Water	1.97 mg/L	10 mL	1.97 mg/L	1	0.07	0.50		6	5/7/19 20:21:00	N	IV
KQ1906023-17	Carbon, Total Organic	DUP	K1903889-001	Water	7.70 mg/L	10 mL	7.70 mg/L	1	0.07	0.50		<1	5/7/19 21:46:00	N	II
KQ1906023-18	Carbon, Total Organic	DUP	K1903889-002	Water	18.53 mg/L	10 mL	18.5 mg/L	1	0.07	0.50		<1	5/7/19 22:14:00	N	II
KQ1906023-19	Carbon, Total Organic	DUP	K1903889-003	Water	14.36 mg/L	10 mL	14.4 mg/L	1	0.07	0.50		2	5/7/19 22:42:00	N	II
KQ1906023-20	Carbon, Total Organic	DUP	K1903763-004	Water	7.05 mg/L	10 mL	705 mg/L	100	7	50		<1	5/7/19 23:10:00	N	II
KQ1906023-21	Carbon, Total Organic	DUP	K1903763-005	Water	6.92 mg/L	10 mL	692 mg/L	100	7	50		3	5/7/19 23:38:00	N	II

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 634659 **Method/Testcode:** SM 5310 C/TOC D

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1903899-001	Carbon, Dissolved Organic (DOC)	N/A		Water	0.57 mg/L	10 mL	0.57 mg/L	1	0.07	0.50			5/8/19 01:47:00	N	I
K1903899-002	Carbon, Dissolved Organic (DOC)	N/A		Water	19.98 mg/L	10 mL	40.0 mg/L	2	0.2	1.0			5/8/19 02:44:00	N	I
K1903947-001	Carbon, Dissolved Organic (DOC)	N/A		Effluent	1.72 mg/L	10 mL	1.72 mg/L	1	0.07	0.50			5/7/19 20:49:00	N	II
K1903947-002	Carbon, Dissolved Organic (DOC)	N/A		Effluent	1.41 mg/L	10 mL	1.41 mg/L	1	0.07	0.50			5/7/19 21:17:00	N	II
KQ1906022-01	Carbon, Dissolved Organic (DOC)	CCB		Effluent	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/7/19 19:38:00	N	II
KQ1906022-02	Carbon, Dissolved Organic (DOC)	CCB		Effluent	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/8/19 00:49:00	N	II
KQ1906022-03	Carbon, Dissolved Organic (DOC)	CCB		Effluent	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/8/19 03:55:00	N	II
KQ1906022-04	Carbon, Dissolved Organic (DOC)	CCV		Effluent	25.09 mg/L	10 mL	25.1 mg/L	1					5/7/19 19:24:00	N	II
KQ1906022-05	Carbon, Dissolved Organic (DOC)	CCV		Effluent	25.59 mg/L	10 mL	25.6 mg/L	1					5/8/19 00:34:00	N	II
KQ1906022-06	Carbon, Dissolved Organic (DOC)	CCV		Effluent	24.60 mg/L	10 mL	24.6 mg/L	1					5/8/19 03:41:00	N	II
KQ1906022-07	Carbon, Dissolved Organic (DOC)	MS	K1903899-001	Water	26.19 mg/L	10 mL	26.2 mg/L	1	0.07	0.50	102		5/8/19 02:15:00	N	II
KQ1906022-08	Carbon, Dissolved Organic (DOC)	DUP	K1903899-001	Water	0.60 mg/L	10 mL	0.60 mg/L	1	0.07	0.50		4	5/8/19 01:47:00	N	II
KQ1906022-09	Carbon, Dissolved Organic (DOC)	DUP	K1903899-002	Water	19.75 mg/L	10 mL	39.5 mg/L	2	0.2	1.0		1	5/8/19 02:44:00	N	II
KQ1906022-10	Carbon, Dissolved Organic (DOC)	DUP	K1903947-001	Effluent	1.72 mg/L	10 mL	1.72 mg/L	1	0.07	0.50		<1	5/7/19 20:49:00	N	II
KQ1906022-11	Carbon, Dissolved Organic (DOC)	DUP	K1903947-002	Effluent	1.39 mg/L	10 mL	1.39 mg/L	1	0.07	0.50		1	5/7/19 21:17:00	N	II
KQ1906022-12	Carbon, Dissolved Organic (DOC)	MB		Effluent	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			5/8/19 01:03:00	N	II
KQ1906022-13	Carbon, Dissolved Organic (DOC)	LCS		Effluent	25.33 mg/L	10 mL	25.3 mg/L	1	0.07	0.50	101		5/8/19 01:18:00	N	II

05/09/19

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

ALS ENVIRONMENTAL

Matrix: WATER

Analysis: Total Organic Carbon (WATER) Method:Oxidation EPA 415.1/9060/5310C

Printout	Sample #	Dil. Factor	Solution Conc.,mg/L	Blank Correction, mg/L	Net mg/L	TOC mg/L	Reported TOC mg/L	
CBA	RB	1			0.0000	0	<0.5	
2	C] CCV 25 ppm [25 p	1	25.087	0.0000	25.0871	25.0871	25.1	5/7/2019
3	[TOC] CCB [0 ppm]	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
4	MB1	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
5	[TOC] LCS [24ppm]	1	25.331	0.0000	25.3309	25.3309	25.3	5/7/2019
6	K1904006-001	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
7	K1904006-001d	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
8	K1904006-002	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
9	K1904006-002d	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
10	K1903965-001	1	1.514	0.0000	1.5136	1.5136	1.51	5/7/2019
11	K1903965-001d	1	1.525	0.0000	1.5251	1.5251	1.5	5/7/2019
12	K1903965-001ms	1	27.527	0.0000	27.5274	27.5274	27.53	5/7/2019
13	K1903997-002	1	0.234	0.0000	0.2341	0.2341	<0.5	5/7/2019
14	K1903997-002d	1	0.188	0.0000	0.1882	0.1882	<0.5	5/7/2019
15	K1903966-001	1	2.909	0.0000	2.9090	2.909	2.9	5/7/2019
16	K1903966-001d	1	2.938	0.0000	2.9382	2.9382	2.9	5/7/2019
17	C] CCV 25 ppm [25 p	1	25.595	0.0000	25.5949	25.5949	25.59	5/7/2019
18	[TOC] CCB [0 ppm]	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
19	K1903966-002	1	3.244	0.0000	3.2436	3.2436	3.2	5/7/2019
20	K1903966-002d	1	3.056	0.0000	3.0563	3.0563	3.06	5/7/2019
21	K1903966-003	1	2.094	0.0000	2.0936	2.0936	2.09	5/7/2019
22	K1903966-003d	1	1.973	0.0000	1.9725	1.9725	2.0	5/7/2019
23	K1903889-001	1	7.745	0.0000	7.7454	7.7454	7.7	5/7/2019
24	K1903889-001d	1	7.704	0.0000	7.7043	7.7043	7.70	5/7/2019
25	K1903889-002	1	18.694	0.0000	18.6941	18.6941	18.69	5/7/2019

ICAL Date 10/20/16 ICAL ID#:11-GEN-05-51A

LCS =24.0 ppm APG 4013 Lot #010615 (REF# 11-GEN-05-50N)

CCV = 25.0 ppm (Ref.#11-GEN-05-52E)

Spike: 0.05 ml of 5000 ppm stock ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

	date	time
Analyzed By: BCD	Date Analyzed 5/7/19	
Reviewed By: [signature]	Date Reviewed 05/09/19	

Revision 1, 2010 R:\WET\ANALYSES\TOC\TEMPLATE\TOCwaterLIMS

ALS ENVIRONMENTAL

Matrix: WATER

Analysis: Total Organic Carbon (WATER) Method:Oxidation EPA 415.1/9060/5310C

Printout	Sample #	Dil. Factor	Solution Conc.,mg/L	Blank Correction, mg/L	Net mg/L	TOC mg/L	Reported TOC mg/L	
26	K1903889-002d	1	18.527	0.0000	18.5272	18.5272	18.53	5/7/2019
27	K1903889-003	1	14.578	0.0000	14.5782	14.5782	14.58	5/7/2019
28	K1903889-003d	1	14.359	0.0000	14.3593	14.3593	14.4	5/7/2019
29	K1903763-004	100	7.047	0.0000	7.0467	704.67	704.7	5/7/2019
30	K1903763-004d	100	7.049	0.0000	7.0489	704.89	704.9	5/7/2019
31	K1903763-005	100	7.110	0.0000	7.1097	710.97	711.0	5/7/2019
32	K1903763-005d	100	6.923	0.0000	6.9234	692.34	692.3	5/7/2019
33	C] CCV 25 ppm [25 p	1	24.769	0.0000	24.7687	24.7687	24.8	5/8/2019
34	[TOC] CCB [0 ppm]	1	0.000	0.0000	0.0000	0	<0.5	5/8/2019
35		1		0.0000	0.0000	0	<0.5	
36		1		0.0000	0.0000	0	<0.5	
37		1		0.0000	0.0000	0	<0.5	
38		1		0.0000	0.0000	0	<0.5	
39		1		0.0000	0.0000	0	<0.5	
40		1		0.0000	0.0000	0	<0.5	
41		1		0.0000	0.0000	0	<0.5	
42		1		0.0000	0.0000	0	<0.5	
43		1		0.0000	0.0000	0	<0.5	
44		1		0.0000	0.0000	0	<0.5	
45		1		0.0000	0.0000	0	<0.5	
46		1		0.0000	0.0000	0	<0.5	
47		1		0.0000	0.0000	0	<0.5	
48		1		0.0000	0.0000	0	<0.5	
49		1		0.0000	0.0000	0	<0.5	
50		1		0.0000	0.0000	0	<0.5	

Analyzed By: BCD	Date Analyzed 5/7/19
Reviewed By: [illegible]	Date Reviewed 05/09/19

ALS ENVIRONMENTAL

Matrix: WATER

Analysis: Total Organic Carbon (WATER) Method:Oxidation EPA 415.1/9060/5310C

Printout	Sample #	Dil. Factor	Solution Conc.,mg/L	Blank Correction, mg/L	Net mg/L	TOC mg/L	Reported TOC mg/L	
CBA	RB	1			0.0000	0	<0.5	
2	C] CCV 25 ppm [25 p	1	25.595	0.0000	25.5949	25.5949	25.6	5/7/2019
3	[TOC] CCB [0 ppm]	1	0.000	0.0000	0.0000	0	<0.5	5/7/2019
4	K1903947-001	1	1.718	0.0000	1.7176	1.7176	1.7	5/7/2019
5	K1903947-001d	1	1.717	0.0000	1.7166	1.7166	1.7	5/7/2019
6	K1903947-002	1	1.410	0.0000	1.4096	1.4096	1.41	5/7/2019
7	K1903947-002d	1	1.391	0.0000	1.3912	1.3912	1.4	5/7/2019
8	C] CCV 25 ppm [25 p	1	24.769	0.0000	24.7687	24.7687	25	5/8/2019
9	[TOC] CCB [0 ppm]	1	0.000	0.0000	0.0000	0	<0.5	5/8/2019
10	MB2	1	0.000	0.0000	0.0000	0	<0.5	5/8/2019
11	[TOC] LCS [24ppm]	1	25.084	0.0000	25.0838	25.0838	25.1	5/8/2019
12	K1903899-001	1	0.575	0.0000	0.5749	0.5749	0.57	5/8/2019
13	K1903899-001d	1	0.597	0.0000	0.5970	0.597	0.60	5/8/2019
14	K1903899-001ms	1	26.188	0.0000	26.1881	26.1881	26.19	5/8/2019
15	K1903899-002	2	19.983	0.0000	19.9825	39.965	40.0	5/8/2019
16	K1903899-002d	2	19.747	0.0000	19.7471	39.4942	39.5	5/8/2019
17	C] CCV 25 ppm [25 p	1	24.602	0.0000	24.6022	24.6022	24.60	5/8/2019
18	[TOC] CCB [0 ppm]	1	0.000	0.0000	0.0000	0	<0.5	5/8/2019
19		1		0.0000	0.0000	0	<0.5	
20		1		0.0000	0.0000	0	<0.5	
21		1		0.0000	0.0000	0	<0.5	
22		1		0.0000	0.0000	0	<0.5	
23		1		0.0000	0.0000	0	<0.5	
24		1		0.0000	0.0000	0	<0.5	
25		1		0.0000	0.0000	0	<0.5	

ICAL Date 10/20/16 ICAL ID#:11-GEN-05-51A

LCS =24.0 ppm APG 4013 Lot #010615 (REF# 11-GEN-05-50N)

CCV = 25.0 ppm (Ref.#11-GEN-05-52E)

Spike: 0.05 ml of 5000 ppm stock ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

		date	time
Analyzed By: BCD	Date Analyzed	5/7/19	
Reviewed By: [signature]	Date Reviewed	05/09/19	

Revision 1, 2010 R:\WET\ANALYSES\TOC\TEMPLATE\TOCwaterLIMS

TOC: 634658
DOC: 634659

Schedule: Daily Run Method 010711

Version: 73
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2019/05/07 17:17 - Tuesday

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps	Use	State
(Clean)	Clean	Clean		1	True	Ready
(Clean)	Clean	Clean		1	True	Ready
(Clean)	Clean	Clean		1	True	Ready
(Blank)	Blank	Reagent/Acid Blank		1	True	Ready
D	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
B	Check Standard	[TOC] CCV 25 ppm [25 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
D	Check Standard	[TOC] CCB [0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
1	Sample	MB1	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
C	Check Standard	[TOC] LCS [24.0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
2	Sample	ICS	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
3	Sample	K1904006-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
4	Sample	K1904006-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
5	Sample	K1903965-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
6	Sample	K1903965-001.01 ms	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
7	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
8	Sample	K1903997-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
9	Sample	K1903966-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
B	Check Standard	[TOC] CCV 25 ppm [25 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
D	Check Standard	[TOC] CCB [0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
10	Sample	K1903966-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
11	Sample	K1903966-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
12	Sample	K1903947-001.03 doc	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
13	Sample	K1903947-002.03 doc	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
14	Sample	K1903889-001.18	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
15	Sample	K1903889-002.18	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
16	Sample	K1903889-003.18	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
17	Sample	K1903763-004.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
18	Sample	K1903763-005.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
19	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
B	Check Standard	[TOC] CCV 25 ppm [25 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
D	Check Standard	[TOC] CCB [0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
20	Sample	MB2	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
C	Check Standard	[TOC] LCS [24.0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
21	Sample	FB	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
22	Sample	K1903899-001.01 doc	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
23	Sample	K1903899-001.01 ms doc	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
24	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
25	Sample	K1903899-002.01 doc 2x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
26	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
B	Check Standard	[TOC] CCV 25 ppm [25 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
D	Check Standard	[TOC] CCB [0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
					False	

05/09/19

Printed on: May 8, 2019 13:29:16

Fusion Report - Daily Run Method 010711 Tuesday, May 07, 2019 01:17 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2019/05/08 13:29 - Wednesday

Report Summary Information

Company Location:	Gen Chem Lab		
Schedule Name:	Daily Run Method 010711	Engine Version:	1.1.5.1
Instrument Name:	Fusion1	Firmware Version:	1.2.0696
Report Version:	1 of 1	Connection:	RS232 COM1
Report Creation by Operators (schedule version):	Fusion1 (Fusion1) (v72) Fusion1 (Fusion1) (v73)		
Comment:			

Report Results

05/09/19

Sample Type: Clean — From Schedule Version 72

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/05/07 13:17

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	15.02	18.20	3.18	49.67	05:27
2	TC Clean	18.18	21.33	3.15	49.78	07:17
3	TC Clean	2.88	5.93	3.05	49.86	07:03
4	TC Clean	1.89	5.02	3.13	50.02	03:50

Sample Type: Clean — From Schedule Version 72

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/05/07 13:45

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	1.15	4.12	2.97	49.61	05:15
2	TC Clean	4.52	7.64	3.12	49.87	07:14
3	TC Clean	1.56	4.66	3.10	50.01	03:47
4	TC Clean	1.10	4.11	3.01	50.03	03:50

Sample Type: Clean From Schedule Version 72

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/05/07 14:10

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.72	3.62	2.90	49.71	05:13
2	TC Clean	3.80	6.60	2.80	50.01	04:04
3	TC Clean	1.46	4.45	2.99	50.00	03:48
4	TC Clean	1.30	4.20	2.90	50.01	03:49

Sample Type: Blank (Creating v1253) From Schedule Version 72

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2019/05/07 14:32

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.83	3.79	2.96	49.69	05:25
2	TC Clean	3.69	6.70	3.01	50.02	04:05
3	TC Clean	1.84	4.72	2.88	50.04	03:50
4	TC Clean	1.34	4.28	2.94	50.03	03:56
5	Reagent Blank	4.03	7.02	3.00	50.02	05:07
6	Acid Blank	1.19	4.24	3.05	49.65	05:29

Sample Type: Sample From Schedule Version 72

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/07 15:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	8.34	11.47	3.13	50.15	10:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 72

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 25 ppm [25 ppm]	0 / infinity (NA / NA)	25.0871 ppm (PASS)	0.0000 ppm	0%	2019/05/07 15:21

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.0871	250.8707	179.75	182.77	3.02	50.10	10:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	50 ppmC

Sample Type: Check Standard --> CCB From Schedule Version 72

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:1	[TOC] CCB [0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2019/05/07 15:36

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	6.82	9.78	2.96	50.14	10:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	0 ppmC

Sample Type: Sample From Schedule Version 72

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	TOC	MB1	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/07 15:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	6.98	10.03	3.04	50.16	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS From Schedule Version 72

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	25.0000	1:1	[TOC] LCS [24.0 ppm]	0 / infinity (NA / NA)	25.3309 ppm (PASS)	0.0000 ppm	0%	2019/05/07 16:05

Pos	Base Analysis	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time

	Type									
C	TOC	25.0 ppm	1	25.3309	253.3088	181.41	184.42	3.01	50.11	10:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos C
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	25 ppmC

Sample Type: Sample

From Schedule Version 72

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	2	TOC	ICS	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/07 16:20

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	8.36	11.40	3.04	50.15	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	K1904006-001.01	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/07 16:34

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.80	8.61	2.81	50.17	10:29
2	TOC	0.0000	0.0000	6.00	8.81	2.81	50.19	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	K1904006-002.01	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/07 17:02

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.72	8.65	2.93	50.20	10:31
2	TOC	0.0000	0.0000	5.83	8.72	2.88	50.26	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Sample

From Schedule Version 73

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	K1903965-001.01	1.5194 ppm	0.0081 ppm	0.5300%	2019/05/07 17:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.5136	15.1361	19.06	22.10	3.04	50.20	10:29

2	TOC	1.5251	15.2510	19.14	21.98	2.84	50.22	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	K1903965-001.01 ms	27.5274 ppm	0.0000 ppm	0.0000%	2019/05/07 17:59

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.5274	275.2739	195.64	198.75	3.11	50.23	10:34

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/07 18:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	6.87	9.75	2.88	50.22	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1903997-002.01	0.2112 ppm	0.0325 ppm	15.3900%	2019/05/07 18:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2341	2.3413	10.37	13.22	2.85	50.22	10:29
2	TOC	0.1882	1.8817	10.06	13.08	3.02	50.18	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1903966-001.01	2.9236 ppm	0.0206 ppm	0.7100%	2019/05/07 18:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.9090	29.0903	28.53	31.45	2.92	50.07	10:28
2	TOC	2.9382	29.3819	28.73	31.64	2.91	50.03	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 73

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 25 ppm [25 ppm]	0 / infinity (NA / NA)	25.5949 ppm (PASS)	0.0000 ppm	0%	2019/05/07 19:24

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.5949	255.9488	183.20	186.12	2.92	49.99	10:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	50 ppmC

Sample Type: Check Standard --> CCB From Schedule Version 73

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:1	[TOC] CCB [0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2019/05/07 19:38

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	6.81	9.62	2.81	49.94	10:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	0 ppmC

Sample Type: Sample From Schedule Version 73

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	TOC	K1903966-002.01	3.1500 ppm	0.1324 ppm	4.2000%	2019/05/07 19:53

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.2436	32.4359	30.80	33.67	2.87	49.91	10:29
2	TOC	3.0563	30.5635	29.53	32.51	2.97	49.92	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	11	TOC	K1903966-003.01	2.0331 ppm	0.0856 ppm	4.2100%	2019/05/07 20:21

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.0936	20.9361	23.00	25.79	2.79	49.90	10:26
2	TOC	1.9725	19.7251	22.17	25.11	2.94	49.88	10:29

Dilution	Blank Contribution	Method	Calibration

1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	12	TOC	K1903947-001.03 doc	1.7171 ppm	0.0007 ppm	0.0400%	2019/05/07 20:49

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.7176	17.1765	20.44	23.25	2.81	49.88	10:29
2	TOC	1.7166	17.1662	20.44	23.33	2.89	49.88	10:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	13	TOC	K1903947-002.03 doc	1.4004 ppm	0.0130 ppm	0.9300%	2019/05/07 21:17

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.4096	14.0960	18.35	21.27	2.92	49.88	10:28
2	TOC	1.3912	13.9119	18.23	21.18	2.95	49.90	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	14	TOC	K1903889-001.18	7.7248 ppm	0.0291 ppm	0.3800%	2019/05/07 21:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.7454	77.4540	61.36	64.31	2.95	49.95	10:26
2	TOC	7.7043	77.0429	61.08	64.04	2.95	49.92	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	15	TOC	K1903889-002.18	18.6106 ppm	0.1180 ppm	0.6300%	2019/05/07 22:14

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	18.6941	186.9408	135.68	138.58	2.90	49.93	10:26
2	TOC	18.5272	185.2716	134.55	137.69	3.14	49.92	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	16	TOC	K1903889-003.18	14.4688 ppm	0.1548 ppm	1.0700%	2019/05/07 22:42

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	14.5782	145.7825	107.74	110.49	2.75	49.95	10:29
2	TOC	14.3593	143.5933	106.26	109.26	3.01	49.96	10:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	17	TOC	K1903763-004.01 100x	7.0478 ppm	0.0016 ppm	0.0200%	2019/05/07 23:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.0467	70.4666	56.62	59.72	3.10	49.99	10:26
2	TOC	7.0489	70.4887	56.63	59.56	2.93	50.00	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	18	TOC	K1903763-005.01 100x	7.0165 ppm	0.1318 ppm	1.8800%	2019/05/07 23:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.1097	71.0971	57.04	59.88	2.84	50.01	10:28
2	TOC	6.9234	69.2335	55.78	58.54	2.76	50.01	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	19	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/08 00:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.84	8.76	2.92	50.02	10:31
2	TOC	0.0000	0.0000	5.71	8.51	2.80	50.04	10:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 73

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.7687 ppm (PASS)	0.0000 ppm	0%	2019/05/08 00:34

Pos	Base Analysis	ID	Rep	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run

	Type		#							Time
B	TOC	25 ppm	1	24.7687	247.6871	177.59	180.54	2.95	50.04	10:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	50 ppmC

Sample Type: Check Standard --> CCB

From Schedule Version 73

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:1	[TOC] CCB [0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2019/05/08 00:49

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	5.94	9.03	3.09	50.05	10:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	0 ppmC

Sample Type: Sample

From Schedule Version 73

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/08 01:03

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	6.15	9.21	3.06	50.06	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS

From Schedule Version 73

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	25.0000	1:1	[TOC] LCS [24.0 ppm]	0 / infinity (NA / NA)	25.0838 ppm (PASS)	0.0000 ppm	0%	2019/05/08 01:18

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	25.0838	250.8382	179.73	182.56	2.83	50.06	10:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos C
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	25 ppmC

Sample Type: Sample From Schedule Version 73

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	FB	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/08 01:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	7.46	10.42	2.96	50.07	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	22	TOC	K1903899-001.01 doc	0.5859 ppm	0.0156 ppm	2.6700%	2019/05/08 01:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.5749	5.7489	12.69	15.55	2.86	50.07	10:28
2	TOC	0.5970	5.9698	12.84	15.85	3.02	50.08	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	23	TOC	K1903899-001.01 ms doc	26.1881 ppm	0.0000 ppm	0.0000%	2019/05/08 02:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.1881	261.8810	186.55	189.41	2.86	50.10	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	24	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/05/08 02:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	6.09	9.08	3.00	50.10	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	25	TOC	K1903899-002.01 doc 2x	19.8648 ppm	0.1665 ppm	0.8400%	2019/05/08 02:44

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	19.9825	199.8254	144.42	147.36	2.94	50.10	10:28
2	TOC	19.7471	197.4712	142.83	145.99	3.16	50.12	10:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	26	TOC	RB	0.0802 ppm	0.1134 ppm	141.4200%	2019/05/08 03:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.1603	1.6033	9.87	12.85	2.98	50.14	10:28
2	TOC	0.0000	0.0000	6.86	9.94	3.08	50.10	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7847 (IC) (v1253)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 73

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.6022 ppm (PASS)	0.0000 ppm	0%	2019/05/08 03:41

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.6022	246.0223	176.46	179.42	2.96	50.11	10:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	50 ppmC

Sample Type: Check Standard --> CCB From Schedule Version 73

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:1	[TOC] CCB [0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2019/05/08 03:55

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	6.27	9.28	3.01	50.14	10:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)	0 ppmC

Meta Data Used in this Report

Blanks

Version	Reagent (Abs)	Acid (Abs)	DI IC (Abs)	DI TC (Abs)	DI TOC (Abs)	Save Time	Operator
v1252	1.0447	0.7470	0.0000	0.0000	0.0000	2019/05/01 17:45	Fusion1 (Fusion1)
v1253	1.3423	1.1900	0.0000	0.0000	0.0000	2019/05/07 15:06	Fusion1 (Fusion1)

Calibrations

Name: CAS_salt_010711 (TOC)

Version: v30

Ver Creation: 2019/03/05 17:42

Comment:

Operator: Fusion1 (Fusion1)

Basic Analysis Type: TOC

Calibration curve formula: TOC: $y = 6.788x + 9.463$

r^2 value: TOC: $r^2 = 0.99963$

Basic Analysis Type: TOC

Sample ID	Y Raw Value	X Expected	Message	End Time
DI Water	7.8970	0.0000		2019/03/05 16:15
0.500 ppm	11.5280	0.5000		2019/03/05 16:29
1.0 ppm	14.9760	1.0000		2019/03/05 16:44
5.0 ppm	43.6500	5.0000		2019/03/05 16:58
10 ppm	79.6020	10.0000		2019/03/05 17:12
25 ppm	183.3580	25.0000		2019/03/05 17:26
50 ppm	346.3230	50.0000		2019/03/05 17:40

Methods

Name: CAS_salt_010711 (TOC)

Version: v4

Ver Creation: 2019/02/21 17:57

Comment:

Operator: Fusion1 (Fusion1)

Parameter	Value
SampleVolume	10.0 mL
Dilution	1:10
AcidVolume	0.5 ml
ReagentVolume	2.0 ml
UVReactorPrerinse	Off
UVReactorPrerinseVolume	5.0
NumberOfUVReactorPrerinses	1
ICSpargeTime	1.00 mins
DetectorSweepFlow	500 ml/min
PreSpargeTime	2.00 mins
SystemFlow	500 ml/min

Advanced Parameter	Value
NeedleRinseVolume	5.0 ml
VialPrimeVolume	2.0 ml
ICSamplePrimeVolume	2.0 ml
ICSpargeRinseVolume	12.0 ml
BaselineStabilizeTime	0.70 min
DetectorPressureFlow	150 ml/min
SyringeSpeedWaste	10
SyringeSpeedAcid	7
SyringeSpeedReagent	7
SyringeSpeedDIWater	7
NDIRPressurization	60 psig

SyringeSpeedSampleDispense	5
SyringeSpeedSampleAspirate	4
SyringeSpeedUVDispense	5
SyringeSpeedUVAspirate	5
SyringeSpeedICDispense	5
SyringeSpeedICAspirate	5
NDIRPressureStabilize	1.75 min
SampleMixing	Off
SampleMixingCycles	1
SampleMixingVolume	10.0
LowLevelFilterNDIR	Off

Acceptance / Approval

Electronic Signatures

Report Version	User Name	Acceptance	Reason	Date

Report History

Report History

Report Version	User Name	System Reason	User Reason	Date
1	Fusion1 (Fusion1)	Schedule completed	Schedule completed	2019/05/08 04:11

StarLIMS Run: 634658, 634659

Analysis: TOC

Method: 415.1, SM 5310 C, 9060, 9060A

CCV: 11-GEN-05-77K 50 ppm LCS: 11-GEN-05-77D 25.0 ppm

ICAL Date: 3/6/19

ICAL ID: 11-GEN-05-76H

ICS ID: 11-GEN-05-74A

ICS TV: 25.0 ppm ICS % R = 2

Spike ID: 11-GEN-05-77J 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-77M

21 % H3PO4: 11-GEN-05-77L

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F, N11314F, Marge

FILTER ID: NA

Analyzed By: BD	Date Analyzed: 5/7/19
Reviewed By: [signature]	Date Reviewed: 05/09/19

10450 Stancliff Rd. Suite 210
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May 15, 2019

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS19050304**

Laboratory Results for: **Longhorn Army Ammunition Plant LHAAP-67**

Dear Susan,

ALS Environmental received 10 sample(s) on May 04, 2019 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 Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
Work Order: HS19050304

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS19050304-01	67WW14-190502	Groundwater		02-May-2019 09:15	04-May-2019 08:55	☐
HS19050304-02	67WW05-190502	Groundwater		02-May-2019 10:05	04-May-2019 08:55	☐
HS19050304-03	67WW12-190502	Groundwater		02-May-2019 11:00	04-May-2019 08:55	☐
HS19050304-04	67WW10-190502	Groundwater		02-May-2019 11:45	04-May-2019 08:55	☐
HS19050304-05	67WW09A-190502	Groundwater		02-May-2019 12:35	04-May-2019 08:55	☐
HS19050304-06	67WW01-190503	Groundwater		03-May-2019 08:10	04-May-2019 08:55	☐
HS19050304-07	67WW15-190503	Groundwater		03-May-2019 09:05	04-May-2019 08:55	☐
HS19050304-08	67WW09-190503	Groundwater		03-May-2019 09:50	04-May-2019 08:55	☐
HS19050304-09	67WW07-190503	Groundwater		03-May-2019 10:35	04-May-2019 08:55	☐
HS19050304-10	TRIP BLANK	Water		03-May-2019 00:00	04-May-2019 08:55	☐

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**CASE NARRATIVE**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
Work Order:	HS19050304	

GCMS Volatiles by Method SW8260

Batch ID: R338430

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:HS19050304
Sample ID:	67WW14-190502	Lab ID:HS19050304-01
Collection Date:	02-May-2019 09:15	Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 16:50
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 16:50
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
1,1-Dichloroethane	**1.4**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 16:50
1,1-Dichloroethene	**5.3**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 16:50
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 16:50
1,2-Dichloroethane	**1.8**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 16:50
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 16:50
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 16:50
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 16:50
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 16:50
Acetone	**6.3**		**0.40**	**1.0**	**2.0**	**UG/L**	1	14-May-2019 16:50
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 16:50
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 16:50
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050304
Sample ID:	67WW14-190502	Lab ID:	HS19050304-01
Collection Date:	02-May-2019 09:15	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 16:50
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 16:50
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 16:50
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 16:50
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 16:50
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 16:50
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 16:50
Surr: 1,2-Dichloroethane-d4	*86.8*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 16:50*
Surr: 4-Bromofluorobenzene	*98.2*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 16:50*
Surr: Dibromofluoromethane	*89.3*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 16:50*
Surr: Toluene-d8	*106*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 16:50*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW05-190502		Lab ID:HS19050304-02
Collection Date:	02-May-2019 10:05		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:14
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:14
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:14
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 17:14
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 17:14
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 17:14
Acetone	**3.8**		**0.40**	**1.0**	**2.0**	**UG/L**	1	14-May-2019 17:14
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 17:14
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:14
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW05-190502		Lab ID:HS19050304-02
Collection Date:	02-May-2019 10:05		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 17:14
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 17:14
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 17:14
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 17:14
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:14
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:14
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:14
Surr: 1,2-Dichloroethane-d4	*87.6*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 17:14*
Surr: 4-Bromofluorobenzene	*97.0*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 17:14*
Surr: Dibromofluoromethane	*89.3*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 17:14*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 17:14*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW12-190502		Lab ID:HS19050304-03
Collection Date:	02-May-2019 11:00		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:38
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:38
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
1,1-Dichloroethene	**2.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 17:38
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:38
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 17:38
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 17:38
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 17:38
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 17:38
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 17:38
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 17:38
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050304
Sample ID:	67WW12-190502	Lab ID:	HS19050304-03
Collection Date:	02-May-2019 11:00	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 17:38
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 17:38
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 17:38
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 17:38
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 17:38
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 17:38
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 17:38
Surr: 1,2-Dichloroethane-d4	*87.9*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 17:38*
Surr: 4-Bromofluorobenzene	*102*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 17:38*
Surr: Dibromofluoromethane	*88.3*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 17:38*
Surr: Toluene-d8	*101*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 17:38*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW10-190502		Lab ID:HS19050304-04
Collection Date:	02-May-2019 11:45		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:02
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:02
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:02
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 18:02
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 18:02
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 18:02
Acetone	**7.8**		**0.40**	**1.0**	**2.0**	**UG/L**	1	14-May-2019 18:02
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 18:02
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:02
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02

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

ALS Houston, US Date: 15-May-19

ANALYTICAL REPORT

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
Sample ID: 67WW10-190502
Collection Date: 02-May-2019 11:45

WorkOrder:HS19050304
Lab ID:HS19050304-04
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 18:02
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 18:02
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 18:02
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 18:02
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:02
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:02
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:02
Surr: 1,2-Dichloroethane-d4	*88.6*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 18:02*
Surr: 4-Bromofluorobenzene	*98.4*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 18:02*
Surr: Dibromofluoromethane	*88.1*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 18:02*
Surr: Toluene-d8	*103*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 18:02*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:HS19050304
Sample ID:	67WW09A-190502	Lab ID:HS19050304-05
Collection Date:	02-May-2019 12:35	Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:14
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:14
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:14
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 13:14
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 13:14
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 13:14
Acetone	**5.0**		**0.40**	**1.0**	**2.0**	**UG/L**	1	14-May-2019 13:14
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 13:14
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:14
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW09A-190502		Lab ID:HS19050304-05
Collection Date:	02-May-2019 12:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 13:14
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 13:14
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 13:14
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 13:14
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:14
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:14
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:14
Surr: 1,2-Dichloroethane-d4	*87.9*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 13:14*
Surr: 4-Bromofluorobenzene	*98.6*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 13:14*
Surr: Dibromofluoromethane	*90.2*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 13:14*
Surr: Toluene-d8	*102*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 13:14*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW01-190503		Lab ID:HS19050304-06
Collection Date:	03-May-2019 08:10		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:38
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:38
1,1,2-Trichloroethane	**1.4**		**0.30**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 13:38
1,1-Dichloroethane	**12**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 13:38
1,1-Dichloroethene	**280**		**1.0**	**2.5**	**5.0**	**UG/L**	5	14-May-2019 15:14
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:38
1,2-Dichloroethane	**21**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 13:38
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:38
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 13:38
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 13:38
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 13:38
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 13:38
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 13:38
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 13:38
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW01-190503		Lab ID:HS19050304-06
Collection Date:	03-May-2019 08:10		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
cis-1,2-Dichloroethene	**0.86**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 13:38
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 13:38
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 13:38
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 13:38
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 13:38
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 13:38
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 13:38
Trichloroethene	**1.3**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 13:38
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 13:38
Vinyl chloride	**0.92**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 13:38
Surr: 1,2-Dichloroethane-d4	*86.1*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 13:38*
Surr: 1,2-Dichloroethane-d4	*88.6*			**0**	*81-118*	*%REC*	*5*	*14-May-2019 15:14*
Surr: 4-Bromofluorobenzene	*99.9*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 13:38*
Surr: 4-Bromofluorobenzene	*99.2*			**0**	*85-114*	*%REC*	*5*	*14-May-2019 15:14*
Surr: Dibromofluoromethane	*89.5*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 13:38*
Surr: Dibromofluoromethane	*88.2*			**0**	*80-119*	*%REC*	*5*	*14-May-2019 15:14*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 13:38*
Surr: Toluene-d8	*104*			**0**	*89-112*	*%REC*	*5*	*14-May-2019 15:14*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:HS19050304
Sample ID:	67WW15-190503	Lab ID:HS19050304-07
Collection Date:	03-May-2019 09:05	Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 14:02
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 14:02
1,1,2-Trichloroethane	**5.4**		**0.30**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 14:02
1,1-Dichloroethane	**9.2**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 14:02
1,1-Dichloroethene	**330**		**1.0**	**2.5**	**5.0**	**UG/L**	5	14-May-2019 15:38
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 14:02
1,2-Dichloroethane	**22**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 14:02
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 14:02
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 14:02
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 14:02
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 14:02
Acetone	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 14:02
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 14:02
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 14:02
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02

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

ALS Houston, US

Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW15-190503		Lab ID:HS19050304-07
Collection Date:	03-May-2019 09:05		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
cis-1,2-Dichloroethene	**1.3**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 14:02
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 14:02
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 14:02
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 14:02
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 14:02
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 14:02
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
Trichloroethene	**1.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	14-May-2019 14:02
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 14:02
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 14:02
Surr: 1,2-Dichloroethane-d4	*89.3*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 14:02*
Surr: 1,2-Dichloroethane-d4	*88.0*			**0**	*81-118*	*%REC*	*5*	*14-May-2019 15:38*
Surr: 4-Bromofluorobenzene	*100*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 14:02*
Surr: 4-Bromofluorobenzene	*101*			**0**	*85-114*	*%REC*	*5*	*14-May-2019 15:38*
Surr: Dibromofluoromethane	*91.0*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 14:02*
Surr: Dibromofluoromethane	*89.0*			**0**	*80-119*	*%REC*	*5*	*14-May-2019 15:38*
Surr: Toluene-d8	*104*			**0**	*89-112*	*%REC*	*5*	*14-May-2019 15:38*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 14:02*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	WorkOrder:	HS19050304
Sample ID:	67WW09-190503	Lab ID:	HS19050304-08
Collection Date:	03-May-2019 09:50	Matrix:	Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:26
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:26
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:26
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 18:26
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 18:26
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 18:26
Acetone	**3.2**		**0.40**	**1.0**	**2.0**	**UG/L**	1	14-May-2019 18:26
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 18:26
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:26
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW09-190503		Lab ID:HS19050304-08
Collection Date:	03-May-2019 09:50		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 18:26
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 18:26
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 18:26
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 18:26
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:26
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:26
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:26
Surr: 1,2-Dichloroethane-d4	*86.0*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 18:26*
Surr: 4-Bromofluorobenzene	*98.7*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 18:26*
Surr: Dibromofluoromethane	*88.3*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 18:26*
Surr: Toluene-d8	*104*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 18:26*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW07-190503		Lab ID:HS19050304-09
Collection Date:	03-May-2019 10:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:50
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:50
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:50
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 18:50
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 18:50
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 18:50
Acetone	**5.1**		**0.40**	**1.0**	**2.0**	**UG/L**	1	14-May-2019 18:50
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 18:50
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 18:50
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	67WW07-190503		Lab ID:HS19050304-09
Collection Date:	03-May-2019 10:35		Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 18:50
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 18:50
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 18:50
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 18:50
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 18:50
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 18:50
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 18:50
Surr: 1,2-Dichloroethane-d4	*86.8*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 18:50*
Surr: 4-Bromofluorobenzene	*99.5*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 18:50*
Surr: Dibromofluoromethane	*87.7*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 18:50*
Surr: Toluene-d8	*103*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 18:50*

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	TRIP BLANK		Lab ID:HS19050304-10
Collection Date:	03-May-2019 00:00		Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 12:25
1,1,2-Trichlor-1,2,2-trifluoroethane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 12:25
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 12:25
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 12:25
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	14-May-2019 12:25
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	14-May-2019 12:25
Acetone	**4.2**		**0.40**	**1.0**	**2.0**	**UG/L**	1	14-May-2019 12:25
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	14-May-2019 12:25
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	14-May-2019 12:25
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25

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

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67		WorkOrder:HS19050304
Sample ID:	TRIP BLANK		Lab ID:HS19050304-10
Collection Date:	03-May-2019 00:00		Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	14-May-2019 12:25
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	14-May-2019 12:25
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	14-May-2019 12:25
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	14-May-2019 12:25
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	14-May-2019 12:25
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	14-May-2019 12:25
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	14-May-2019 12:25
Surr: 1,2-Dichloroethane-d4	*88.0*			**0**	*81-118*	*%REC*	*1*	*14-May-2019 12:25*
Surr: 4-Bromofluorobenzene	*101*			**0**	*85-114*	*%REC*	*1*	*14-May-2019 12:25*
Surr: Dibromofluoromethane	*90.3*			**0**	*80-119*	*%REC*	*1*	*14-May-2019 12:25*
Surr: Toluene-d8	*103*			**0**	*89-112*	*%REC*	*1*	*14-May-2019 12:25*

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

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050304

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R338430	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C			**Matrix:** Water		
HS19050304-10	TRIP BLANK	03 May 2019 00:00			14 May 2019 12:25	1
Batch ID R338430	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C			**Matrix:** Groundwater		
HS19050304-01	67WW14-190502	02 May 2019 09:15			14 May 2019 16:50	1
HS19050304-02	67WW05-190502	02 May 2019 10:05			14 May 2019 17:14	1
HS19050304-03	67WW12-190502	02 May 2019 11:00			14 May 2019 17:38	1
HS19050304-04	67WW10-190502	02 May 2019 11:45			14 May 2019 18:02	1
HS19050304-05	67WW09A-190502	02 May 2019 12:35			14 May 2019 13:14	1
HS19050304-06	67WW01-190503	03 May 2019 08:10			14 May 2019 15:14	5
HS19050304-06	67WW01-190503	03 May 2019 08:10			14 May 2019 13:38	1
HS19050304-07	67WW15-190503	03 May 2019 09:05			14 May 2019 15:38	5
HS19050304-07	67WW15-190503	03 May 2019 09:05			14 May 2019 14:02	1
HS19050304-08	67WW09-190503	03 May 2019 09:50			14 May 2019 18:26	1
HS19050304-09	67WW07-190503	03 May 2019 10:35			14 May 2019 18:50	1

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**QC BATCH REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
WorkOrder:	HS19050304	

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190514** Units: **UG/L** Analysis Date: **14-May-2019 11:37**

Client ID: Run ID: **VOA6_338430** SeqNo: **5075195** 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-Trichlor-1,2,2-trifluoroethane	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

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050304

QC BATCH REPORT

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190514** Units: **UG/L** Analysis Date: **14-May-2019 11:37**
Client ID: Run ID: **VOA6_338430** SeqNo: **5075195** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	0.50	1.0								U
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	1.0	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	*42.59*	*1.0*	*50*	*0*	*85.2*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*48.97*	*1.0*	*50*	*0*	*97.9*	*85 - 114*				
Surr: Dibromofluoromethane	*43.89*	*1.0*	*50*	*0*	*87.8*	*80 - 119*				

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.
Project:	Longhorn Army Ammunition Plant LHAAP-67
WorkOrder:	HS19050304

QC BATCH REPORT

Batch ID: **R338430 (0)** **Instrument:** **VOA6** **Method:** **VOLATILES ORGANICS BY METHOD 8260C**

MBLK Sample ID: **VBLKW-190514** Units: **UG/L** Analysis Date: **14-May-2019 11:37**

Client ID: Run ID: **VOA6_338430** SeqNo: **5075195** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*52.89*	*1.0*	*50*	*0*	*106*	*89 - 112*				

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050304

QC BATCH REPORT

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

LCS Sample ID: **VLCSW-190514** Units: **UG/L** Analysis Date: **14-May-2019 10:49**
Client ID: Run ID: **VOA6_338430** SeqNo: **5075194** 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	19.65	1.0	20	0	98.3	78 - 124				
1,1,1-Trichloroethane	19.21	1.0	20	0	96.0	74 - 131				
1,1,2,2-Tetrachloroethane	19.94	1.0	20	0	99.7	71 - 121				
1,1,2-Trichlor-1,2,2-trifluoroethane	20.17	1.0	20	0	101	70 - 136				
1,1,2-Trichloroethane	19.79	1.0	20	0	98.9	80 - 119				
1,1-Dichloroethane	19.1	1.0	20	0	95.5	77 - 125				
1,1-Dichloroethene	19.64	1.0	20	0	98.2	71 - 131				
1,1-Dichloropropene	19.1	1.0	20	0	95.5	78 - 125				
1,2,3-Trichlorobenzene	22.8	1.0	20	0	114	69 - 129				
1,2,3-Trichloropropane	19.99	1.0	20	0	99.9	73 - 122				
1,2,4-Trichlorobenzene	20.95	1.0	20	0	105	69 - 130				
1,2,4-Trimethylbenzene	19.27	1.0	20	0	96.3	76 - 124				
1,2-Dibromo-3-chloropropane	20.82	1.0	20	0	104	62 - 128				
1,2-Dibromoethane	19.76	1.0	20	0	98.8	77 - 121				
1,2-Dichlorobenzene	19.39	1.0	20	0	96.9	80 - 119				
1,2-Dichloroethane	19.2	1.0	20	0	96.0	73 - 128				
1,2-Dichloropropane	20.1	1.0	20	0	100	78 - 122				
1,3,5-Trimethylbenzene	19.23	1.0	20	0	96.2	75 - 124				
1,3-Dichlorobenzene	19.33	1.0	20	0	96.7	80 - 119				
1,3-Dichloropropane	19.66	1.0	20	0	98.3	80 - 119				
1,4-Dichlorobenzene	19.64	1.0	20	0	98.2	79 - 118				
2,2-Dichloropropane	19.71	1.0	20	0	98.6	60 - 139				
2-Butanone	41.52	2.0	40	0	104	56 - 143				
2-Chlorotoluene	18.51	1.0	20	0	92.5	79 - 122				
2-Hexanone	40.58	2.0	40	0	101	57 - 139				
4-Chlorotoluene	18.69	1.0	20	0	93.4	78 - 122				
4-Isopropyltoluene	18.93	1.0	20	0	94.6	77 - 127				
4-Methyl-2-pentanone	39.72	2.0	40	0	99.3	67 - 130				
Acetone	44.55	2.0	40	0	111	39 - 160				
Benzene	19.69	1.0	20	0	98.4	79 - 120				
Bromobenzene	19.68	1.0	20	0	98.4	80 - 120				
Bromochloromethane	19.96	1.0	20	0	99.8	78 - 123				
Bromodichloromethane	20.01	1.0	20	0	100	79 - 125				
Bromoform	21	1.0	20	0	105	66 - 130				

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050304

QC BATCH REPORT

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

LCS Sample ID: **VLCSW-190514** Units: **UG/L** Analysis Date: **14-May-2019 10:49**
Client ID: Run ID: **VOA6_338430** SeqNo: **5075194** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	22.76	1.0	20	0	114	53 - 141				
Carbon disulfide	39.51	2.0	40	0	98.8	64 - 133				
Carbon tetrachloride	18.82	1.0	20	0	94.1	72 - 136				
Chlorobenzene	19.91	1.0	20	0	99.5	82 - 118				
Chloroethane	18.27	1.0	20	0	91.3	60 - 138				
Chloroform	19.45	1.0	20	0	97.2	79 - 124				
Chloromethane	18.59	1.0	20	0	93.0	50 - 139				
cis-1,2-Dichloroethene	19.06	1.0	20	0	95.3	78 - 123				
cis-1,3-Dichloropropene	20.18	1.0	20	0	101	75 - 124				
Dibromochloromethane	19.83	1.0	20	0	99.2	74 - 126				
Dibromomethane	20.15	1.0	20	0	101	79 - 123				
Dichlorodifluoromethane	21.17	1.0	20	0	106	32 - 152				
Ethylbenzene	19.47	1.0	20	0	97.3	79 - 121				
Hexachlorobutadiene	20.77	1.0	20	0	104	66 - 134				
Isopropylbenzene	19.15	1.0	20	0	95.7	72 - 131				
m,p-Xylene	38.81	2.0	40	0	97.0	80 - 121				
Methylene chloride	20.12	2.0	20	0	101	74 - 124				
Naphthalene	20.78	1.0	20	0	104	61 - 128				
n-Butylbenzene	19.23	1.0	20	0	96.1	75 - 128				
n-Propylbenzene	18.85	1.0	20	0	94.2	76 - 126				
o-Xylene	19.46	1.0	20	0	97.3	78 - 122				
sec-Butylbenzene	18.62	1.0	20	0	93.1	77 - 126				
Styrene	20.18	1.0	20	0	101	78 - 123				
tert-Butylbenzene	18.7	1.0	20	0	93.5	78 - 124				
Tetrachloroethene	19.22	1.0	20	0	96.1	74 - 129				
Toluene	19.42	1.0	20	0	97.1	80 - 121				
trans-1,2-Dichloroethene	19.89	1.0	20	0	99.5	75 - 124				
trans-1,3-Dichloropropene	20.67	1.0	20	0	103	73 - 127				
Trichloroethene	19.92	1.0	20	0	99.6	79 - 123				
Trichlorofluoromethane	19.39	1.0	20	0	96.9	65 - 141				
Vinyl chloride	19.64	1.0	20	0	98.2	58 - 137				
Surr: 1,2-Dichloroethane-d4	*49.83*	*1.0*	*50*	*0*	*99.7*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*50.82*	*1.0*	*50*	*0*	*102*	*85 - 114*				
Surr: Dibromofluoromethane	*48.75*	*1.0*	*50*	*0*	*97.5*	*80 - 119*				

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**QC BATCH REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
WorkOrder:	HS19050304	

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

LCS Sample ID: **VLCSW-190514** Units: **UG/L** Analysis Date: **14-May-2019 10:49**

Client ID: Run ID: **VOA6_338430** SeqNo: **5075194** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*48.69*	*1.0*	*50*	*0*	*97.4*	*89 - 112*				

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050304

QC BATCH REPORT

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19050304-05MS** Units: **UG/L** Analysis Date: **14-May-2019 14:26**
Client ID: **67WW09A-190502** Run ID: **VOA6_338430** SeqNo: **5075202** 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	17.96	1.0	20	0	89.8	78 - 124				
1,1,1-Trichloroethane	17.27	1.0	20	0	86.4	74 - 131				
1,1,2,2-Tetrachloroethane	19.07	1.0	20	0	95.4	71 - 121				
1,1,2-Trichlor-1,2,2-trifluoroethane	19.02	1.0	20	0	95.1	70 - 136				
1,1,2-Trichloroethane	18.35	1.0	20	0	91.8	80 - 119				
1,1-Dichloroethane	16.46	1.0	20	0	82.3	77 - 125				
1,1-Dichloroethene	17.19	1.0	20	0	86.0	71 - 131				
1,1-Dichloropropene	18.19	1.0	20	0	91.0	78 - 125				
1,2,3-Trichlorobenzene	21.91	1.0	20	0	110	69 - 129				
1,2,3-Trichloropropane	18.51	1.0	20	0	92.6	73 - 122				
1,2,4-Trichlorobenzene	20.05	1.0	20	0	100	69 - 130				
1,2,4-Trimethylbenzene	17.85	1.0	20	0	89.3	76 - 124				
1,2-Dibromo-3-chloropropane	20.62	1.0	20	0	103	62 - 128				
1,2-Dibromoethane	18.37	1.0	20	0	91.9	77 - 121				
1,2-Dichlorobenzene	18.43	1.0	20	0	92.2	80 - 119				
1,2-Dichloroethane	16.81	1.0	20	0	84.1	73 - 128				
1,2-Dichloropropane	17.63	1.0	20	0	88.2	78 - 122				
1,3,5-Trimethylbenzene	18.57	1.0	20	0	92.8	75 - 124				
1,3-Dichlorobenzene	18.44	1.0	20	0	92.2	80 - 119				
1,3-Dichloropropane	18.25	1.0	20	0	91.3	80 - 119				
1,4-Dichlorobenzene	18.41	1.0	20	0	92.1	79 - 118				
2,2-Dichloropropane	17.18	1.0	20	0	85.9	60 - 139				
2-Butanone	36.74	2.0	40	0	91.9	56 - 143				
2-Chlorotoluene	18.14	1.0	20	0	90.7	79 - 122				
2-Hexanone	36.41	2.0	40	0	91.0	57 - 139				
4-Chlorotoluene	18.02	1.0	20	0	90.1	78 - 122				
4-Isopropyltoluene	19.4	1.0	20	0	97.0	77 - 127				
4-Methyl-2-pentanone	37.53	2.0	40	0	93.8	67 - 130				
Acetone	41.3	2.0	40	5.033	90.7	39 - 160				
Benzene	17.22	1.0	20	0	86.1	79 - 120				
Bromobenzene	17.54	1.0	20	0	87.7	80 - 120				
Bromochloromethane	16.53	1.0	20	0	82.6	78 - 123				
Bromodichloromethane	17.16	1.0	20	0	85.8	79 - 125				
Bromoform	18.69	1.0	20	0	93.5	66 - 130				

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050304

QC BATCH REPORT

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19050304-05MS** Units: **UG/L** Analysis Date: **14-May-2019 14:26**

Client ID: **67WW09A-190502** Run ID: **VOA6_338430** SeqNo: **5075202** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	14.83	1.0	20	0	74.1	53 - 141				
Carbon disulfide	34.64	2.0	40	0	86.6	64 - 133				
Carbon tetrachloride	17.45	1.0	20	0	87.2	72 - 136				
Chlorobenzene	18.68	1.0	20	0	93.4	82 - 118				
Chloroethane	16.04	1.0	20	0	80.2	60 - 138				
Chloroform	16.36	1.0	20	0	81.8	79 - 124				
Chloromethane	14.06	1.0	20	0	70.3	50 - 139				
cis-1,2-Dichloroethene	16.27	1.0	20	0	81.4	78 - 123				
cis-1,3-Dichloropropene	18.73	1.0	20	0	93.7	75 - 124				
Dibromochloromethane	18.41	1.0	20	0	92.0	74 - 126				
Dibromomethane	17.7	1.0	20	0	88.5	79 - 123				
Dichlorodifluoromethane	15.98	1.0	20	0	79.9	32 - 152				
Ethylbenzene	18.41	1.0	20	0	92.1	79 - 121				
Hexachlorobutadiene	21.25	1.0	20	0	106	66 - 134				
Isopropylbenzene	18.73	1.0	20	0	93.7	72 - 131				
m,p-Xylene	37.34	2.0	40	0	93.4	80 - 121				
Methylene chloride	16.74	2.0	20	0	83.7	74 - 124				
Naphthalene	20.25	1.0	20	0	101	61 - 128				
n-Butylbenzene	19.47	1.0	20	0	97.4	75 - 128				
n-Propylbenzene	19.15	1.0	20	0	95.8	76 - 126				
o-Xylene	19.15	1.0	20	0	95.7	78 - 122				
sec-Butylbenzene	19.76	1.0	20	0	98.8	77 - 126				
Styrene	18.13	1.0	20	0	90.7	78 - 123				
tert-Butylbenzene	19.35	1.0	20	0	96.8	78 - 124				
Tetrachloroethene	18.9	1.0	20	0	94.5	74 - 129				
Toluene	18.38	1.0	20	0	91.9	80 - 121				
trans-1,2-Dichloroethene	17.28	1.0	20	0	86.4	75 - 124				
trans-1,3-Dichloropropene	17.81	1.0	20	0	89.1	73 - 127				
Trichloroethene	18.37	1.0	20	0	91.9	79 - 123				
Trichlorofluoromethane	16.85	1.0	20	0	84.3	65 - 141				
Vinyl chloride	17.11	1.0	20	0	85.5	58 - 137				
Surr: 1,2-Dichloroethane-d4	*43.63*	*1.0*	*50*	*0*	*87.3*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*50.27*	*1.0*	*50*	*0*	*101*	*85 - 114*				
Surr: Dibromofluoromethane	*45.19*	*1.0*	*50*	*0*	*90.4*	*80 - 119*				

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.
Project:	Longhorn Army Ammunition Plant LHAAP-67
WorkOrder:	HS19050304

QC BATCH REPORT

Batch ID: **R338430 (0)** **Instrument:** **VOA6** **Method:** **VOLATILES ORGANICS BY METHOD 8260C**

MS Sample ID: **HS19050304-05MS** Units: **UG/L** Analysis Date: **14-May-2019 14:26**

Client ID: **67WW09A-190502** Run ID: **VOA6_338430** SeqNo: **5075202** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*52*	*1.0*	*50*	*0*	*104*	*89 - 112*				

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**QC BATCH REPORT**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
WorkOrder:	HS19050304	

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MSD Sample ID: **HS19050304-05MSD** Units: **UG/L** Analysis Date: **14-May-2019 14:50**

Client ID: **67WW09A-190502** Run ID: **VOA6_338430** SeqNo: **5075203** 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	18.05	1.0	20	0	90.3	78 - 124	17.96	0.499	20	
1,1,1-Trichloroethane	16.75	1.0	20	0	83.7	74 - 131	17.27	3.11	20	
1,1,2,2-Tetrachloroethane	20.62	1.0	20	0	103	71 - 121	19.07	7.82	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	18.76	1.0	20	0	93.8	70 - 136	19.02	1.38	20	
1,1,2-Trichloroethane	18.77	1.0	20	0	93.9	80 - 119	18.35	2.27	20	
1,1-Dichloroethane	15.96	1.0	20	0	79.8	77 - 125	16.46	3.1	20	
1,1-Dichloroethene	16.38	1.0	20	0	81.9	71 - 131	17.19	4.84	20	
1,1-Dichloropropene	17.86	1.0	20	0	89.3	78 - 125	18.19	1.86	20	
1,2,3-Trichlorobenzene	24.61	1.0	20	0	123	69 - 129	21.91	11.6	20	
1,2,3-Trichloropropane	20.12	1.0	20	0	101	73 - 122	18.51	8.29	20	
1,2,4-Trichlorobenzene	21.58	1.0	20	0	108	69 - 130	20.05	7.37	20	
1,2,4-Trimethylbenzene	19.04	1.0	20	0	95.2	76 - 124	17.85	6.43	20	
1,2-Dibromo-3-chloropropane	23.37	1.0	20	0	117	62 - 128	20.62	12.5	20	
1,2-Dibromoethane	18.7	1.0	20	0	93.5	77 - 121	18.37	1.8	20	
1,2-Dichlorobenzene	20.02	1.0	20	0	100	80 - 119	18.43	8.27	20	
1,2-Dichloroethane	16.81	1.0	20	0	84.1	73 - 128	16.81	0.00614	20	
1,2-Dichloropropane	17.42	1.0	20	0	87.1	78 - 122	17.63	1.19	20	
1,3,5-Trimethylbenzene	19.67	1.0	20	0	98.3	75 - 124	18.57	5.76	20	
1,3-Dichlorobenzene	19.64	1.0	20	0	98.2	80 - 119	18.44	6.33	20	
1,3-Dichloropropane	18.61	1.0	20	0	93.0	80 - 119	18.25	1.94	20	
1,4-Dichlorobenzene	19.37	1.0	20	0	96.8	79 - 118	18.41	5.05	20	
2,2-Dichloropropane	16.54	1.0	20	0	82.7	60 - 139	17.18	3.8	20	
2-Butanone	36.99	2.0	40	0	92.5	56 - 143	36.74	0.672	20	
2-Chlorotoluene	19.27	1.0	20	0	96.3	79 - 122	18.14	6	20	
2-Hexanone	38.67	2.0	40	0	96.7	57 - 139	36.41	6.02	20	
4-Chlorotoluene	19.19	1.0	20	0	96.0	78 - 122	18.02	6.3	20	
4-Isopropyltoluene	20.54	1.0	20	0	103	77 - 127	19.4	5.71	20	
4-Methyl-2-pentanone	38.72	2.0	40	0	96.8	67 - 130	37.53	3.12	20	
Acetone	42.23	2.0	40	5.033	93.0	39 - 160	41.3	2.22	20	
Benzene	17.15	1.0	20	0	85.7	79 - 120	17.22	0.446	20	
Bromobenzene	18.86	1.0	20	0	94.3	80 - 120	17.54	7.22	20	
Bromochloromethane	15.89	1.0	20	0	79.5	78 - 123	16.53	3.91	20	
Bromodichloromethane	16.76	1.0	20	0	83.8	79 - 125	17.16	2.31	20	
Bromoform	19.5	1.0	20	0	97.5	66 - 130	18.69	4.22	20	

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
WorkOrder: HS19050304

QC BATCH REPORT

Batch ID: R338430 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MSD Sample ID: **HS19050304-05MSD** Units: **UG/L** Analysis Date: **14-May-2019 14:50**
Client ID: **67WW09A-190502** Run ID: **VOA6_338430** SeqNo: **5075203** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	14.44	1.0	20	0	72.2	53 - 141	14.83	2.67	20	
Carbon disulfide	33.71	2.0	40	0	84.3	64 - 133	34.64	2.72	20	
Carbon tetrachloride	17.32	1.0	20	0	86.6	72 - 136	17.45	0.729	20	
Chlorobenzene	18.86	1.0	20	0	94.3	82 - 118	18.68	0.95	20	
Chloroethane	15.18	1.0	20	0	75.9	60 - 138	16.04	5.54	20	
Chloroform	15.86	1.0	20	0	79.3	79 - 124	16.36	3.15	20	
Chloromethane	13.31	1.0	20	0	66.6	50 - 139	14.06	5.44	20	
cis-1,2-Dichloroethene	15.91	1.0	20	0	79.6	78 - 123	16.27	2.26	20	
cis-1,3-Dichloropropene	18.59	1.0	20	0	92.9	75 - 124	18.73	0.759	20	
Dibromochloromethane	18.51	1.0	20	0	92.5	74 - 126	18.41	0.558	20	
Dibromomethane	17.47	1.0	20	0	87.4	79 - 123	17.7	1.28	20	
Dichlorodifluoromethane	15.52	1.0	20	0	77.6	32 - 152	15.98	2.93	20	
Ethylbenzene	18.16	1.0	20	0	90.8	79 - 121	18.41	1.34	20	
Hexachlorobutadiene	21.15	1.0	20	0	106	66 - 134	21.25	0.477	20	
Isopropylbenzene	19.08	1.0	20	0	95.4	72 - 131	18.73	1.81	20	
m,p-Xylene	37.75	2.0	40	0	94.4	80 - 121	37.34	1.1	20	
Methylene chloride	16.03	2.0	20	0	80.1	74 - 124	16.74	4.31	20	
Naphthalene	22.61	1.0	20	0	113	61 - 128	20.25	11	20	
n-Butylbenzene	20.47	1.0	20	0	102	75 - 128	19.47	5.02	20	
n-Propylbenzene	20.31	1.0	20	0	102	76 - 126	19.15	5.87	20	
o-Xylene	19.03	1.0	20	0	95.1	78 - 122	19.15	0.637	20	
sec-Butylbenzene	20.71	1.0	20	0	104	77 - 126	19.76	4.7	20	
Styrene	17.96	1.0	20	0	89.8	78 - 123	18.13	0.935	20	
tert-Butylbenzene	20.46	1.0	20	0	102	78 - 124	19.35	5.56	20	
Tetrachloroethene	19.07	1.0	20	0	95.4	74 - 129	18.9	0.914	20	
Toluene	18.07	1.0	20	0	90.4	80 - 121	18.38	1.68	20	
trans-1,2-Dichloroethene	17.11	1.0	20	0	85.5	75 - 124	17.28	0.993	20	
trans-1,3-Dichloropropene	17.87	1.0	20	0	89.3	73 - 127	17.81	0.302	20	
Trichloroethene	17.81	1.0	20	0	89.1	79 - 123	18.37	3.1	20	
Trichlorofluoromethane	16.6	1.0	20	0	83.0	65 - 141	16.85	1.52	20	
Vinyl chloride	16.44	1.0	20	0	82.2	58 - 137	17.11	3.99	20	
Surr: 1,2-Dichloroethane-d4	*43.69*	*1.0*	*50*	*0*	*87.4*	*81 - 118*	*43.63*	*0.13*	*20*	
Surr: 4-Bromofluorobenzene	*49.42*	*1.0*	*50*	*0*	*98.8*	*85 - 114*	*50.27*	*1.71*	*20*	
Surr: Dibromofluoromethane	*44.57*	*1.0*	*50*	*0*	*89.1*	*80 - 119*	*45.19*	*1.39*	*20*	

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.
Project:	Longhorn Army Ammunition Plant LHAAP-67
WorkOrder:	HS19050304

QC BATCH REPORT

Batch ID: **R338430 (0)** **Instrument:** **VOA6** **Method:** **VOLATILES ORGANICS BY METHOD 8260C**

MSD Sample ID: **HS19050304-05MSD** Units: **UG/L** Analysis Date: **14-May-2019 14:50**

Client ID: **67WW09A-190502** Run ID: **VOA6_338430** SeqNo: **5075203** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*52.58*	*1.0*	*50*	*0*	*105*	*89 - 112*	*52*	*1.12*	*20*	

The following samples were analyzed in this batch:

HS19050304-01	HS19050304-02	HS19050304-03	HS19050304-04
HS19050304-05	HS19050304-06	HS19050304-07	HS19050304-08
HS19050304-09	HS19050304-10		

ALS Houston, US Date: 15-May-19

Client:	Aptim Environmental & Infrastucture, Inc.	**QUALIFIERS, ACRONYMS, UNITS**
Project:	Longhorn Army Ammunition Plant LHAAP-67	
WorkOrder:	**HS19050304**	

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Illinois	004438	29-Jun-2019
Louisiana	03087	30-Jun-2019
Dept of Defense	ANAB L2231	20-Dec-2021
Kansas	E-10352 2018-2019	31-Jul-2019
Oklahoma	2018-156	31-Aug-2019
North Carolina	624-2019	31-Dec-2019
Maryland	343, 2018-2019	30-Jun-2019
Arkansas	19-028-0	27-Mar-2020
Texas	TX104704231-19-23	30-Apr-2020

ALS Houston, US Date: 15-May-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP-67
Work Order: HS19050304

SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS19050304-01	67WW14-190502	Login	5/6/2019 6:04:22 PM	NDR	WET357
HS19050304-01	67WW14-190502	Login	5/6/2019 6:04:22 PM	NDR	VOA111
HS19050304-01	67WW14-190502	Login	5/6/2019 6:04:22 PM	NDR	Sub
HS19050304-01	67WW14-190502	Login	5/6/2019 6:04:22 PM	NDR	Sub
HS19050304-01	67WW14-190502	Login	5/6/2019 6:04:22 PM	NDR	Sub

ALS Houston, US Date: 15-May-19

Sample Receipt Checklist

Client Name:	CBI-Houston	Date/Time Received:	**04-May-2019 08:55**
Work Order:	HS19050304	Received by:	**NDR**

Checklist completed by: *Nilesh D. Ranchod* (eSignature) 6-May-2019 (Date)

Reviewed by: *RJ Modashia* (eSignature) 7-May-2019 (Date)

Matrices: **water**

Carrier name: **FedEx Priority Overnight**

Question	Yes	No	Not Present
Shipping container/cooler in good condition?	☑	☐	☐
Custody seals intact on shipping container/cooler?	☑	☐	☐
Custody seals intact on sample bottles?	☐	☐	☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☐	☑	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s): 1.7c/ uc/c | IR 25

Cooler(s)/Kit(s): 43361

Date/Time sample(s) sent to storage: 05/04/2019 13:00

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

pH adjusted by:

Login Notes: Sample Label time differ .
67WW09A-190502
COC = 12:35
Label = 12:13

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

APTIM

Page 1 of

COC ID: LHAAP67-MAY2019-ALS

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name	Longhorn AAP	Lab Name	ALS Laboratories	Email Invoice To	FedInvoices@aptim.com
Project Number	501032	Lab Contact	RJ Modashia		
	LHAAP-67	Email	RJ.Modashia@alsglobal.com	Email Report To	Susan.Huang@aptim.com
Address	1203-B East Grand Avenue	Address	10450 Stancliff Rd., Suite 210	Mail Reports To	Susan Huang
	PMB 202			Address	4005 Port Chicago Highway, Suite 200
City	Marshall; State TX	City	Houston; State TX	City	Concord; State CA
Postal Code	75670; Country USA	Postal Code	77099; Country USA	Postal Code	94520; Country USA
Phone Number	713.243.7264	Phone Number	281.575.2279 or 281.530.5656		
Project Manager	Praveen Srivastav			Shipping Company	

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	Vocs by 8260B (3-40 ml VOA/HCL)	MEE by RSK175 (3-40 ml VOA/HCL)	CO2 by RSK175 (3-40 ml VOA/Cool to 6 deg C)	TOC by Sm5310C (2-40ml Amber/H2SO4)	Anions (chloride/sulfate/nitrate) by 9056 (1-250ml/Cool to 6 deg C)
67WW14-190502	LHAAP 67	18.78	19.02		WG	5/2/19	0915	3		X				
67WW05-190502	LHAAP 67	24.46	24.68		WG	5/2/19	1005	3		X				
67WW12-190502	LHAAP67	23.85	24.05		WG	5/2/19	1100	3		X				
67WW10-190502	LHAAP67	22.31	22.53		WG	5/2/19	1145	3		X				
67WW09A-190502	LHAAP67	24.35	24.58		WG	5/2/19	1235	3		X				
67WW09A-190502-MS	LHAAP 67	24.35	24.58		WG	5/2/19	1235	3		X				
67WW09A-190502-MSD	LHAAP 67	24.35	24.58		WG	5/2/19	1235	3		X				
67WW01-190503	LHAAP 67	22.97	23.23		WG	5/3/19	0810	3		X				
67WW15-190503	LHAAP67	22.04	23.23		WG	5/3/19	0905	3		X				
67WW09-190503	LHAAP67	19.83	20.06		WG	5/3/19	0950	3		X				
67WW07-190503	LHAAP67	21.72	21.95		WG	5/3/19	1035	3		X				
Trip BLANK	LHAAP 67				W	5/3/19		2		X				

Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant LHAAP-67
HS19050304

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Scott Beesing / BHATE	5/3/19 1200	R. Chavez 5/3/19 13:55	
			Cooler # 43361 IR2 25	
			Temp 1.7c	

00955028

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

43361

CUSTODY SEAL
Date: 5/3/19 Time: 1200
Name: Scott Beesinger
Company: BHATE

Seal Broken By: KA
Date: 05/04/19

43361 MAY 0 4 2019
MAY 0 4 2019

Must Deliver Next Business Day
Time and Tempature Sensitive!

43361

ALS

ORIGIN ID:SGRA (903) 930-6193
SCOTT BEESINGER
APTIM ENVIROMENTAL & INFASTRUCTURE
1203-B EAST GRAND AVE
PMB 202
MARSHALL, TX 75670
UNITED STATES US

SHIP DATE: 23APR19
ACTWGT: 1.00 LB MAN
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP 67 – RJ
RMA:

FedEx Express
E

FedEx
TRK# 0221 4809 7833 1019

SATURDAY 12:00P
PRIORITY OVERNIGHT

77099
TX-US
IAH

X0 SGRA

FID 5121960 03MAY19 GGGA 553C1/D66C/0C8A

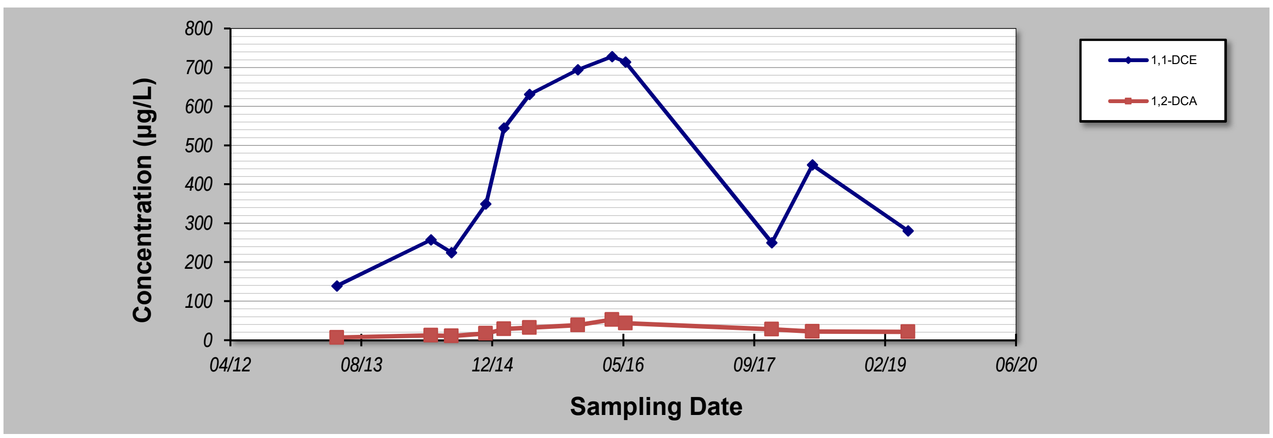
Appendix E

Mann-Kendall Trend Test Results

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	16-Aug-19	Job ID:	501032
Facility Name:	LHAAP-67	Constituent:	67WW01
Conducted By:	Robert Mayer	Concentration Units:	µg/L

Sampling Event	Sampling Date	67WW01 CONCENTRATION (µg/L)						
Sampling Point ID:		1,1-DCE	1,2-DCA					
1	13-May-13	139	7					
2	7-May-14	257	12					
3	25-Jul-14	224	11					
4	3-Dec-14	349	17					
5	10-Feb-15	544	29					
6	19-May-15	631	31					
7	19-Nov-15	694	39					
8	29-Mar-16	728	53					
9	19-May-16	714	43					
10	28-Nov-17	250	28					
11	3-May-18	450	22					
12	3-May-19	280	21					
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.49	0.54					
Mann-Kendall Statistic (S):		24	26					
Confidence Factor:		94.2%	95.7%					
Concentration Trend:		Prob. Increasing	Increasing					



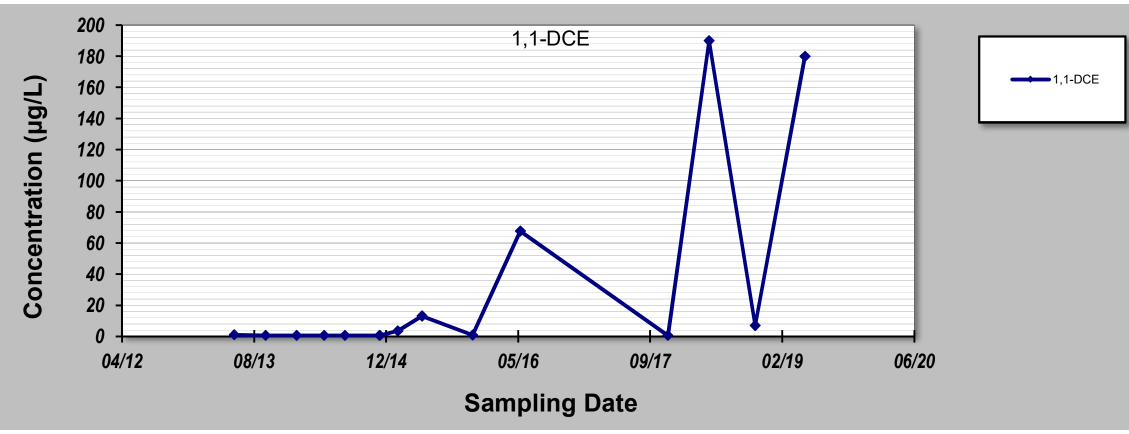
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	25-Aug-19	Job ID:	501032
Facility Name:	LHAAP-67	Constituent:	67WW02
Conducted By:	Robert Mayer	Concentration Units:	µg/L

Sampling Event	Sampling Date	67WW02 CONCENTRATION (µg/L)						
Sampling Point ID:		1,1-DCE						
1	31-May-13	1						
2	27-Sep-13	0.5						
3	23-Jan-14	0.5						
4	6-May-14	0.5						
5	24-Jul-14	0.5						
6	3-Dec-14	0.5						
7	10-Feb-15	3.59						
8	12-May-15	13.2						
9	12-May-15	13						
10	19-Nov-15	0.857						
11	19-May-16	67.6						
12	28-Nov-17	0.5						
13	3-May-18	190						
14	25-Oct-18	6.9						
15	1-May-19	180						
16								
17								
18								
19								
20								
Coefficient of Variation:		2.02						
Mann-Kendall Statistic (S):		48						
Confidence Factor:		99.1%						
Concentration Trend:		Increasing						



Notes:

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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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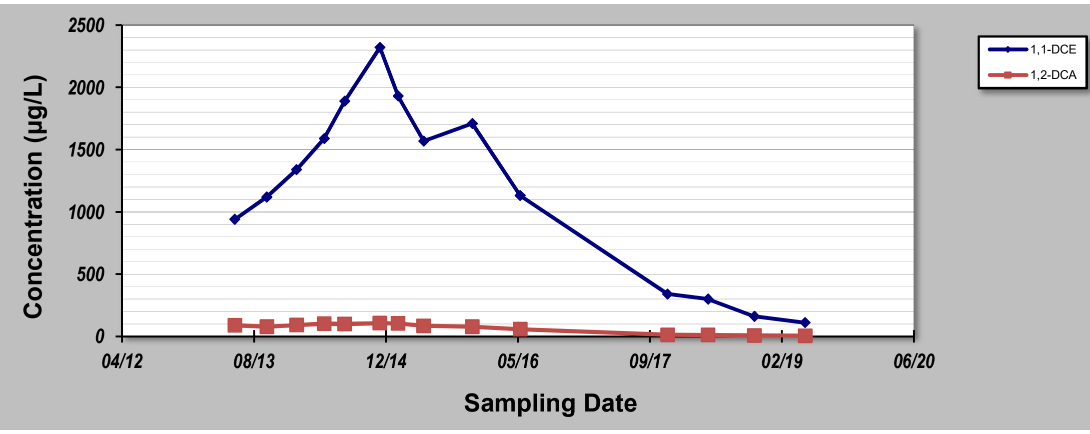
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	16-Aug-19	Job ID:	501032
Facility Name:	LHAAP-67	Constituent:	67WW08
Conducted By:	Robert Mayer	Concentration Units:	µg/L

Sampling Event	Sampling Date	67WW08 CONCENTRATION (µg/L)						
	Sampling Point ID:	1,1-DCE	1,2-DCA					
1	3-Jun-13	940	89.2					
2	2-Oct-13	1,120	76.5					
3	23-Jan-14	1,340	89.9					
4	7-May-14	1,590	101					
5	24-Jul-14	1,890	98.9					
6	4-Dec-14	2,320	106					
7	11-Feb-15	1,930	104					
8	19-May-15	1,570	85.6					
9	19-Nov-15	1,710	77.6					
10	19-May-16	1,130	56.1					
11	28-Nov-17	340	13					
12	1-May-18	300	11					
13	23-Oct-18	160	6.5					
14	3-May-19	110	5.1					
15								
16								
17								
18								
19								
20								
	Coefficient of Variation:	0.61	0.60					
	Mann-Kendall Statistic (S):	-31	-51					
	Confidence Factor:	95.0%	99.8%					
	Concentration Trend:	Prob. Decreasing	Decreasing					



Notes:
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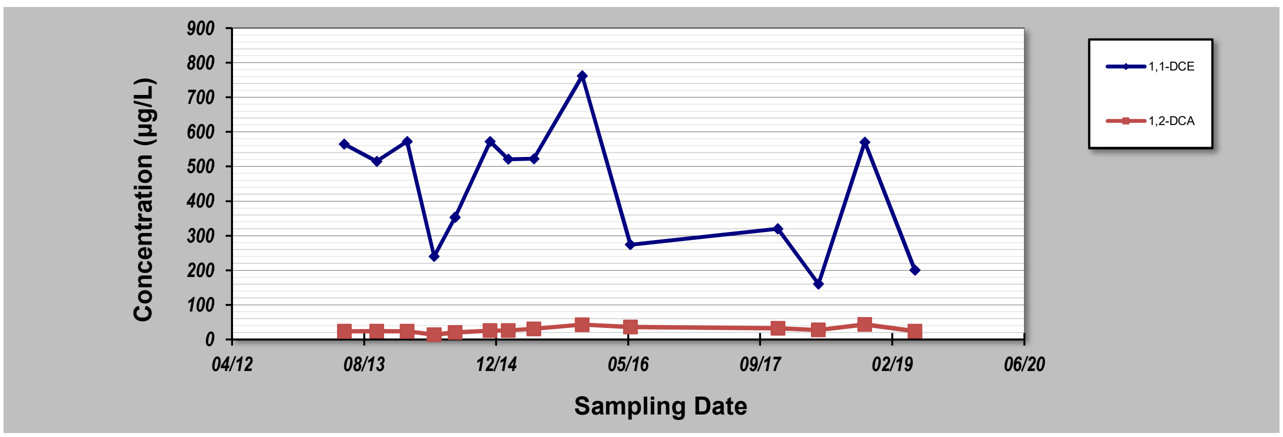
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	16-Aug-19	Job ID:	501032
Facility Name:	LHAAP-67	Constituent:	67WW13
Conducted By:	Robert Mayer	Concentration Units:	µg/L

Sampling Event	Sampling Date	67WW13 CONCENTRATION (µg/L)						
Sampling Point ID:		1,1-DCE	1,2-DCA					
1	31-May-13	565	23.1					
2	1-Oct-13	515	23.8					
3	24-Jan-14	572	22.9					
4	6-May-14	240	13.7					
5	25-Jul-14	353	19.8					
6	4-Dec-14	572	24.9					
7	11-Feb-15	521	26					
8	19-May-15	522	30.6					
9	18-Nov-15	762	42.6					
10	19-May-16	274	35.7					
11	28-Nov-17	320	32					
12	1-May-18	160	27					
13	23-Oct-18	570	43					
14	1-May-19	200	24					
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.41	0.30					
Mann-Kendall Statistic (S):		-20	45					
Confidence Factor:		84.8%	99.3%					
Concentration Trend:		Stable	Increasing					



Notes:

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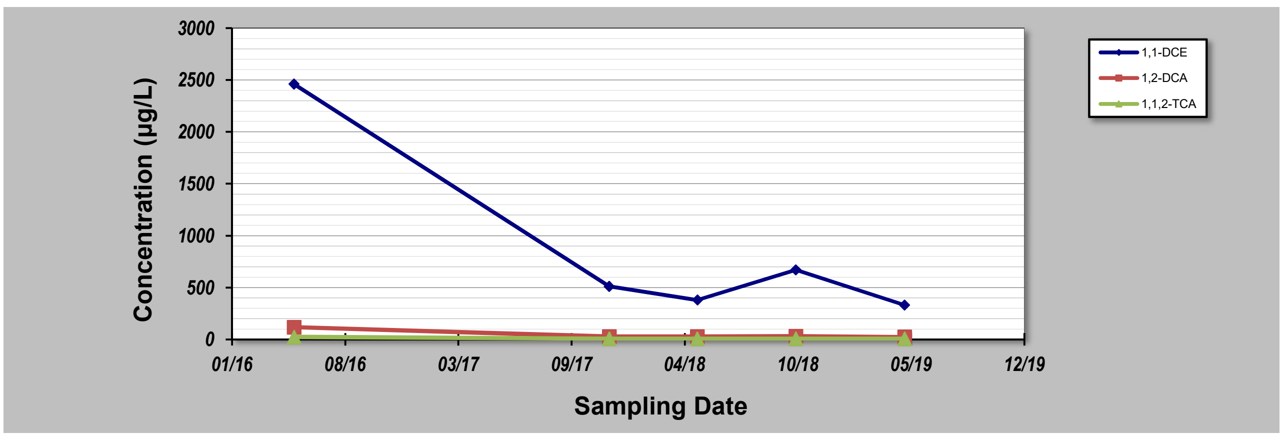
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	16-Aug-19	Job ID:	501032
Facility Name:	LHAAP-67	Constituent:	67WW15
Conducted By:	Robert Mayer	Concentration Units:	µg/L

Sampling Point ID:		1,1-DCE	1,2-DCA	1,1,2-TCA				
Sampling Event	Sampling Date	67WW15 CONCENTRATION (µg/L)						
1	19-May-16	2,460	117	22.7				
2	27-Nov-17	510	27	5.6				
3	2-May-18	380	26	5.6				
4	23-Oct-18	670	30	6				
5	3-May-19	330	22	5.4				
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		1.03	0.92	0.84				
Mann-Kendall Statistic (S):		-6	-6	-5				
Confidence Factor:		88.3%	88.3%	82.1%				
Concentration Trend:		No Trend	Stable	Stable				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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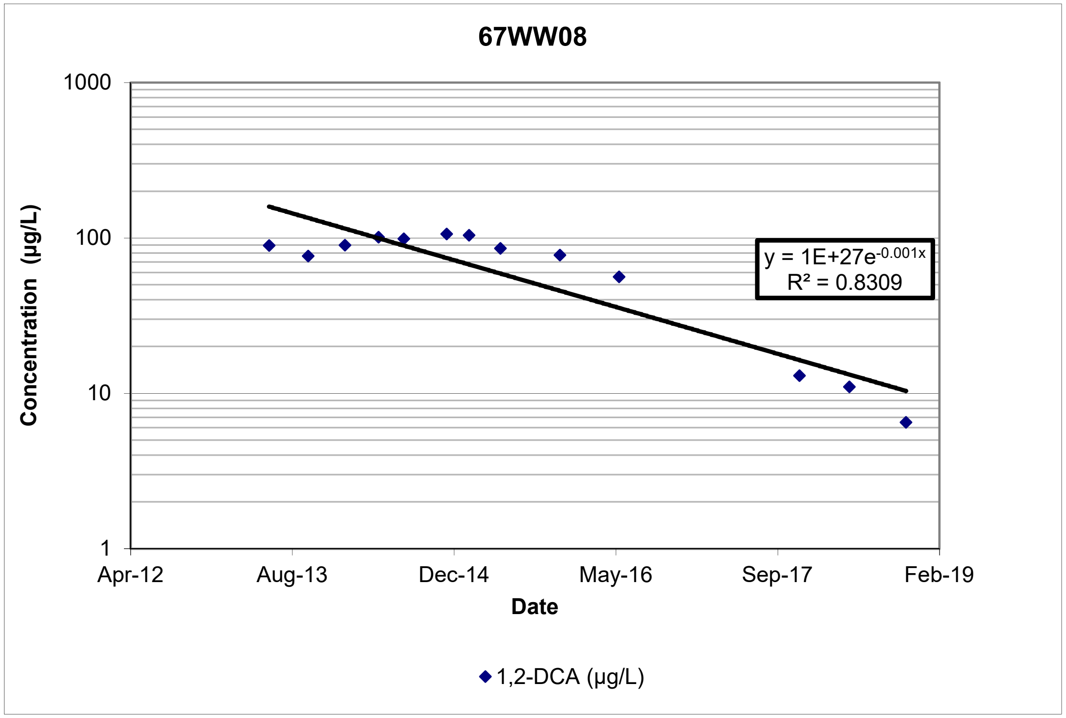
Appendix F

Regression Analysis

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • March 2020

Time-Dependent Attenuation Rate Constant and Estimated Cleanup Time
67WW08

Date	1,2-DCA (µg/L)
3-Jun-13	89.2
2-Oct-13	76.5
23-Jan-14	89.9
7-May-14	101
24-Jul-14	98.9
4-Dec-14	106
11-Feb-15	104
19-May-15	85.6
19-Nov-15	77.6
19-May-16	56.1
28-Nov-17	13
1-May-18	11
23-Oct-18	6.5
1-May-19	5.1



Chemical: TCE Well ID	Attenuation Rate Constant (day^{-1})	Attenuation Half-life (days)	Attenuation Half-life (years)	Current Conc. (µg/L)	Target Concentration for TCE (µg/L)	Estimated Cleanup Time (years)
1,2-DCA	0.0010	693.1	1.9	5.1	5	0.1

Notes:

The estimated cleanup time was calculated as the time it would take the most recent detected TCE concentration to reach the MCL using the site-specific attenuation rate, and assuming first order degradation kinetics.

µg/L - micrograms per liter

MCL - maximum contaminant level

DCE - dichloroethene

DCA - dichloroethane

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

March 17, 2020

DAIN-ODB-LO

Mr. William Rhotenberry
U.S. Environmental Protection Agency
1201 Elm Street, Suite 500
Dallas, TX 75270-2002

Re: Draft Second Annual Remedial Action Operation Report, LHAAP-35B (37), Chemical Laboratory, Longhorn Army Ammunition Plant, Karnack, Texas, March 2020

Dear Mr. Rhotenberry,

One hard copy and one compact disc (CD) of the above-referenced document are being transmitted to you for your review. Review comments are requested by April 16, 2020.

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, 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.

Sincerely,

Rose M. Zeiler

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

Copies furnished:
A. Palmie, TCEQ, Austin, TX (letter)
P. Bruckwicki, Caddo Lake NWR, TX (1 hard copy and 1 CD)
R. Smith USACE, Tulsa District, OK (1 hard copy and 1 CD)
A. Williams, USACE, Tulsa District, OK (1 CD)
A. Maly USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 hard copy and 1 CD)
P. Srivastav, APTIM, Houston, TX (letter)

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

March 17, 2020

DAIN-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 Second Annual Remedial Action Operation Report, LHAAP-35B (37), Chemical Laboratory, Longhorn Army Ammunition Plant, Karnack, Texas, March 2020

Dear Ms. Palmie,

One hard copy and one compact disc (CD) of the above-referenced document are being transmitted to you for your review. Review comments are requested by April 16, 2020.

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Sincerely,

Rose M. Zeiler

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

Copies furnished:
W. Rhotenberry, USEPA Region 6, Dallas, TX (letter)
P. Bruckwicki, Caddo Lake NWR, TX (1 hard copy and 1 CD)
R. Smith, USACE, Tulsa District, OK (1 hard copy and 1 CD)
A. Williams, USACE, Tulsa District, OK (1 CD)
A. Maly, USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 hard copy and 1 CD)
P. Srivastav, APTIM, Houston, TX (letter)

00955039

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

March 25, 2020

DAIN-ODB-LO

Mr. William Rhotenberry
US Environmental Protection Agency
Region 6
201 Elm Street, Suite 500
Dallas, TX 75270

Re: Request for Schedule Extension for LHAAP-47

Dear Mr. Rhotenberry,

An extension of the LHAAP-47 schedule is respectfully requested based on the results of the Preliminary Site Investigation (PSI) Addendum 2 results, reported to you in December 2019 as a draft interim report. The December report revealed that the zone of TCE impact near Building 46-A in soil and groundwater, including residual DNAPL, was greater than anticipated. Additional fieldwork is required to adequately characterize extent and to support the identification of additional remedial alternatives.

This additional information comprises significant new site conditions that constitute good cause in accordance with Federal Facility Agreement (FFA) Sections XVI.D and XVII.A and will result in an additional delay to the completion of the RI/FS phase (Reference Army correspondence dated August 5, 2019).

The proposed schedule to collect and report additional information as well as a revision of the Feasibility Study, Proposed Plan and ROD is as follows:

Draft PSI Addendum 2 Work Plan Addendum:	May 1, 2020
Draft PSI Addendum 2 Report:	October 26, 2020

Draft FS Addendum change from March 31, 2020 to December 8, 2020

Draft Revised PP change from July 1, 2020 to March 31, 2021

Revised Draft Final ROD change from September 30, 2020 to September 15, 2021

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.

Sincerely,

Rose M. Zeiler

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

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P. Bruckwicki, Caddo Lake NWR, Karnack, TX
R. Smith, USACE, Tulsa District, OK
A. Williams, USACE, Tulsa District, OK
A. Maly, USAEC, San Antonio, TX
K. Nemmers – (for project files)

00955041

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

March 25, 2020

DAIN-ODB-LO

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

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