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Final Corrective Action Implementation Report
Former Pumphouse #1 (Release #1)
Former Building 8060
Hunter Army Airfield
Savannah, GA
Facility ID No. 9-025085*1

July 15, 2010

DOCUMENT 24

ARCADIS

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Final Corrective Action Implementation Report Pumphouse #1 (Release #1)

Hunter Army Airfield

Prepared for:
U.S. Army Environmental Command

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Our Ref.:
GP08HAFS.H13B.NB1R1

Date:
July 15, 2010

Acronyms

ACL	alternate concentration limit
BTEX	benzene, toluene, ethylbenzene, and xylene
CAP	Corrective Action Plan
COPCs	Constituents of Potential Concern
DAACG	Departure/Arrival Air Control Group
ft	feet
ft bls	feet below land surface
g/L	grams per liter
GA EPD	Georgia Environmental Protection Division
HAAF	Hunter Army Air Field
IW	Injection Well
lbs	pounds
lbs/gal	pounds per gallon
MNA	monitored natural attenuation
MW	monitor well
PVC	polyvinyl chloride
SAIC	Science Applications International Corporation
UIC	Underground Injection Control
UST	underground storage tank
USTMP	Underground Storage Tank Management Program

CORRECTIVE ACTION IMPLEMENTATION REPORT

Submittal Date: July 2010 Report Title/Number: Corrective Action Implementation Report

For Period Covering: March 2010 to May 2010

Facility Name: Former Pumphouse #1 (Release #1) Street Address: Former Building 8060, near Taxiway 3

Facility ID: 9-025085*1 City: Hunter Army Airfield County: Chatham Zip Code: 31409

Latitude: 32° 00′ 54″ Longitude: 81° 08′ 26″

Submitted by UST Owner/Operator:		Prepared by Consultant/Contractor:	
Name:	Thomas C. Fry/ Environmental Branch	Name:	Charles A. Bertz
Company:	U. S. Army/HQ 3d, Inf. Div. (Mech)	Company:	ARCADIS, U.S., Inc.
Address:	DPW ENRD ENV. Building 1137	Address:	801 Corporate Center Drive
	1550 Frank Cochran Drive		Suite 300
City:	Fort Stewart State: GA	City:	Raleigh State: NC
Zip Code:	31314-4927	Zip Code:	27607
Telephone:	(912) 767-2010	Telephone:	(919) 854-1282

1. Registered Professional Engineer or Professional Geologist Certification

I hereby certify that I have directed and supervised the fieldwork and preparation of this plan in accordance with State Rules and Regulations. As a registered professional geologist and/or professional engineer, I certify that I am a qualified groundwater professional as defined by the Georgia State Board of Professional Geologists. All of the information and laboratory data in this plan and in all of the attachments are true, accurate, complete, and in accordance with applicable State Rules and Regulations.

Name: Curtis S. Bostian

Signature: _____

Date: _____

_____

Georgia Stamp or Seal

2. Introduction

Former Pumphouse #1 was an aviation-fuel island located along the east-west taxiway of Hunter Army Airfield (HAAF) (Figure 2-1) that was used from about 1953 until the early 1970s. It consisted of ten 25,000-gallon underground storage tanks (USTs) and a 50,000-gallon underground defueling tank. The pumphouse was inactive from the 1970s to 1995, when eight of the 25,000-gallon USTs were removed. The 50,000-gallon defueling tank and two of the 25,000-gallon tanks remained in-place, partially under the pumphouse structure. In 1998, the pumphouse structure was removed, along with the two remaining 25,000-gallon USTs. The 50,000-gallon defueling tank was closed in-place. The piping from the boundary of the pumphouse facility to the bulk fuel farm was also drained, pigged, and grouted in-place.

The horizontal and vertical extent of petroleum-related impacts in soil and groundwater was delineated by activities performed during the previous investigations at the former Pumphouse #1 site and the Departure/Arrival Air Control Group (DAACG) facility. The investigations are documented in the Corrective Action Plan (CAP)–Part B Report (Science Applications International Corporation [SAIC] 2000), the CAP–Part B Addendum #1 Report (SAIC 2002) and the CAP–Part B Addendum #2 Report (SAIC 2006). As indicated in the former Pumphouse #1 CAP–Part B Report, two distinct and separate plumes are located within the vicinity of the former Pumphouse #1 site. Release #1 is an area of soil and groundwater contamination located near the DAACG facility that is in the vicinity of former Fuel Pits 1A and 1B, located approximately 900 feet (ft) west of former Building 8060 (i.e., Pumphouse #1). Release #2 is an area of soil and groundwater contamination located near the former Pumphouse #1 facility and former Fuel Pits 1C and 1D, located approximately 200 ft north of the former Tank Pits. The Release 1 and Release 2 areas are presented in Figure 2-1. The corrective actions at Release #2 are addressed in separate documents.

Benzene, toluene, ethylbenzene, and xylenes (BTEX) were among the chemicals of potential concern (COPCs) for site groundwater. The recommended remedial strategy for groundwater in the previous CAPs was free product removal followed by monitored natural attenuation (MNA). The first phase of the corrective action has been completed as free product is no longer present at recoverable quantities and has been consistently less than 1/8 inch in thickness in monitor wells. The second phase of the corrective action is remediation of groundwater to below Georgia Environmental Protection Department (GA EPD) approved alternate concentration limits (ACLs). To reduce the estimated timeframe for groundwater to reach ACLs, an active corrective action addressing the remaining smear zone and groundwater impacts was recommended in the Revised CAP – Part B (ARCADIS 2009b) and the Revised CAP – Part B Addendum #1 (ARCADIS 2009a). The proposed corrective action included using calcium peroxide to increase oxygen concentrations in the aquifer and stimulate biodegradation of the BTEX compounds.

The proposed remedy in the Revised CAP – Part B Addendum #1 (ARCADIS 2009a) was approved by GA EPD Underground Storage Tank Management Program (USTMP) on February 5, 2010. A copy of the Underground Injection Control (UIC) permit for the injection of calcium peroxide, which was approved by GA EPD on April 5, 2010, is included in Appendix C. Calcium peroxide injections occurred from April 6 through

April 30, 2010. The calcium peroxide will provide a sustained source of oxygen to enhance aerobic biodegradation of the residual BTEX present in this area. This report includes a summary of the corrective action implementation activities performed through May 2010.

3. Remedial Activities

3.1 Injection Permit

A UIC permit was obtained from the GA EPD Watershed Protection Branch to inject calcium peroxide for the purpose of remediating petroleum hydrocarbon impacts. The UIC permit application was approved by GA EPD on March 31, 2010, and is included as Appendix C. All injection activities were in compliance with permit requirements. The mass of calcium peroxide injected was below the permitted maximum amount and the injection pressures were at or below levels stipulated in the permit. As described below, smaller diameter injection wells were installed than described in the permit to mitigate potential geotechnical risks.

3.2 Well Installation

Twelve injection wells (IW), P1R1-IW-01 through P1R2-IW-12, were installed south of the DAACG from March 10 to 15, 2010. The injection wells were constructed using 2-inch diameter polyvinyl chloride (PVC) casing and screened from 5 to 20 feet below land surface (ft bls) with 0.010-inch slotted PVC screen. The injection well screen intervals were selected to ensure the ability to inject across the full vertical extent of aquifer impacts. All wells were installed through paved areas potentially subject to aircraft traffic and were installed using 2-inch instead of 4-inch diameter materials to lessen the chance of structural damage. Each well was completed in an 8-inch diameter flush-mounted, traffic-bearing vault. The row of injection wells closest to the DAACG building was moved about 30 ft southeast to avoid the concrete vehicle loading structure. Injection well drilling logs can be found in Appendix D.

In addition to the injection wells, two monitor wells (MW), P1R2-MW-01 and P1R2-MW-02, were installed south of the DAACG building, as directed by the GA EPD USTMP, to better delineate the BTEX impacts in groundwater. The monitor wells consisted of 2-inch diameter PVC casing, screened from 5 to 15 ft bls with 0.010-inch slotted PVC screen. The monitor well screen intervals were selected to bracket the water table. Each well was completed in an 8-inch diameter flush-mounted, traffic-bearing vault. Monitor well logs can be found in Appendix D. The locations of the newly installed injection and monitor wells can be found on Figure 3-1.

3.3 Pre-Injection Monitoring

Prior to calcium peroxide injections, groundwater samples were collected from injection well P1R1-IW-02 and monitoring wells P1R1-MW-01 and P1R1-MW-02 on March 29, 2010. Monitor well D-MW-02, the most proximal monitor well to the injection wells, was sampled in December 2009 and those results will also be used as a baseline for evaluation of the effects of the injection. The results from this sampling event can be found in Table 3-1. The pre-injection monitor well sample results from March 2009 are included on Figure 3-2. The laboratory analytical report for the samples collected on March 29, 2010 can be found in Appendix E.

3.4 Injections

As described in the Revised CAP – Part B Addendum #1, calcium peroxide was selected to stimulate biodegradation of BTEX in groundwater. Calcium peroxide was selected because it provides more sustained oxygen and is more soluble than other oxygen releasing materials. The slower release of oxygen provides for a more efficient use of the released oxygen.

Calcium peroxide was injected into each well as slurry at an average concentration of 0.233 pounds per gallon (lbs/gal) [28 grams per liter (g/L)]. Calcium peroxide injections occurred from April 6, 2010 until April 30, 2010. During this time, a total of 4,510 pounds (lbs) of calcium peroxide were injected into the twelve injection wells. The amount of calcium peroxide injected into each well varied from 254 lbs in P1R1-IW-06 to 626 lbs in P1R1-IW-02. Potable water was injected after the calcium peroxide solution to better distribute the calcium peroxide as well as to flush the area immediately adjacent to the injection wells. The amount of chase water injected into each well varied from 503 gallons in P1R1-IW-05 to 789 gallons in P1R1-IW-07. The mass and volumes injected into each injection well are included in Table 3-2 and presented on Figure 3-3. For reference on groundwater flow direction, a groundwater potentiometric surface map presenting the December 2009 data is included as Figure 3-4.

4. Conclusions and Recommendations

4.1 Conclusions

The following conclusions are presented:

- Twelve injection wells were successfully installed at the Pumphouse 1, Release #1 site. Injection rates indicate that the twelve injection wells are hydraulically connected to the surficial aquifer and are adequately constructed for this and future injections.

- The total of 4,510 lbs of calcium peroxide was injected into the twelve injection wells. This mass will provide approximately 766 lbs of slow release oxygen in order to stimulate aerobic biodegradation of the BTEX targets. Because of the lag in response that is typical for biostimulation remedies, sampling of area wells was not conducted immediately after the injections.

- The injection rate decreased as injections proceeded due to obstruction of mobile porosity by the low solubility calcium peroxide. The use of chase water helped distribute the calcium peroxide. Injection rates for future events will likely increase as the calcium peroxide previously injected dissolves.

- The sampling results from the 2 monitor wells installed at the site conformed to previous estimates of the impacted area.

4.2 Recommendations

The following recommendations are presented:

- ARCADIS will conduct quarterly performance monitoring at the site. The performance monitoring will include measurement of field parameters, including temperature, pH, dissolved oxygen, conductivity, and turbidity. Groundwater samples will also be collected for laboratory analysis of BTEX constituents and total suspended solids. The following wells are recommended to be sampled as part of the June 2010 performance monitoring: P1R1-IW-02, P1R1-MW-01, P1R1-MW-02, D-MW-01, D-MW-02, D-MW-34, D-MW-35, D-MW-36, D-MW-37, and D-MW-43.

- The first two quarterly events will be conducted in June 2010 and September 2010. The need for additional or more frequent sampling will be evaluated based on the data from these two events.

- During the June sampling event, groundwater elevations should be taken in all injection wells and select monitor wells in the target plume. The groundwater gauging results will be used to evaluate the groundwater flow directions within the targeted treatment area. This information would be used in preparation of a future injection strategy.

- After the second performance monitoring event in September, ARCADIS will evaluate all post-injection data to determine the dosing, schedule and overall strategy for the next round of calcium peroxide injections.

The proposed modified post-injection monitoring program is presented in Table 4-1.

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5. Reimbursement

Hunter Army Airfield is a federally owned facility and has funded the investigation for the former Pumphouse #1 Release #1 site using U. S. Department of Defense Environmental Restoration Account Funds. Application for Georgia USTMP Trust Fund reimbursement is not being pursued at this time.

6. References

ARCADIS. 2009a. Revised Corrective Action Plan – Part B Addendum #1 for Former Pumphouse #1 (Release #1), Former Building 8060, Facility ID #9-025085*1, Hunter Army Airfield, Georgia. October.

ARCADIS. 2009b. Revised Corrective Action Plan – Part B with 2008 Annual Report for Former Pumphouse #1 (Release #1), Former Building 8060, Facility ID #9-025085*1, Hunter Army Airfield, Georgia. June.

Science Applications International Corporation (SAIC). 2006. Corrective Action Plan–Part B Addendum #2 for Former Pumphouse #1, Facility ID #9-025085, Building 8060, Hunter Army Airfield, Georgia. July.

SAIC. 2002. Corrective Action Plan–Part B Addendum #1 for Former Pumphouse #1, Facility ID #9-025085, Building 8060, Hunter Army Airfield, Georgia. July.

SAIC. 2000. Corrective Action Plan–Part B for Former Pumphouse #1, Facility ID #9-025085, Building 8060, Hunter Army Airfield, Georgia. August.

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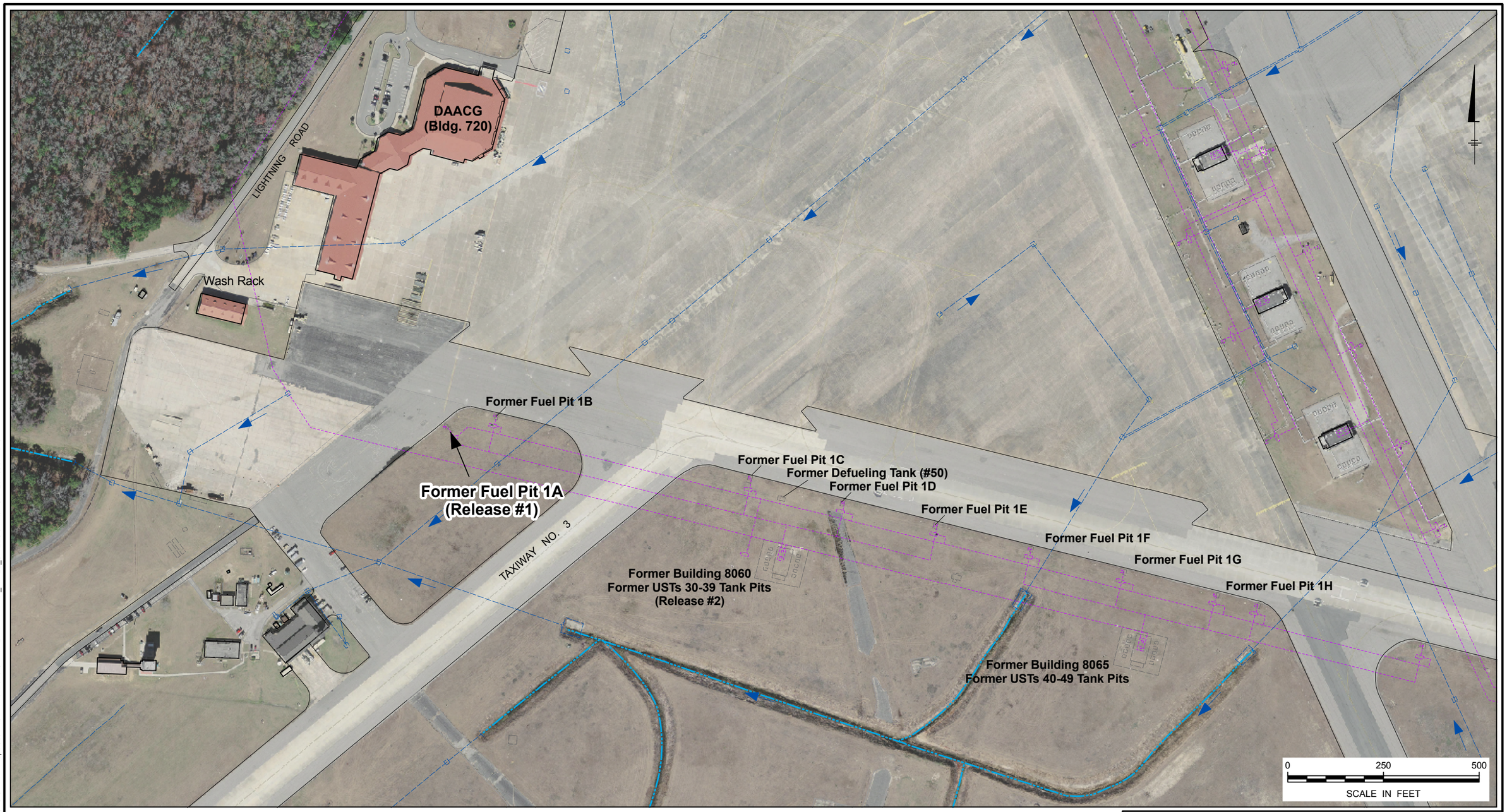
Appendix A

Figures



LEGEND

- Surface Water Drainage System
- Surface Water Drainage Canal
- Surface Water Flow Direction
- Former Fuel Transfer Line

REFERENCE: SAGIS (2008).

HUNTER ARMY AIRFIELD, GEORGIA
FORMER PUMPHOUSE #1 (RELEASE #1)
FORMER BUILDING 8060, FACILITY ID #9-025085
CORRECTIVE ACTION IMPLEMENTATION REPORT

Site Location

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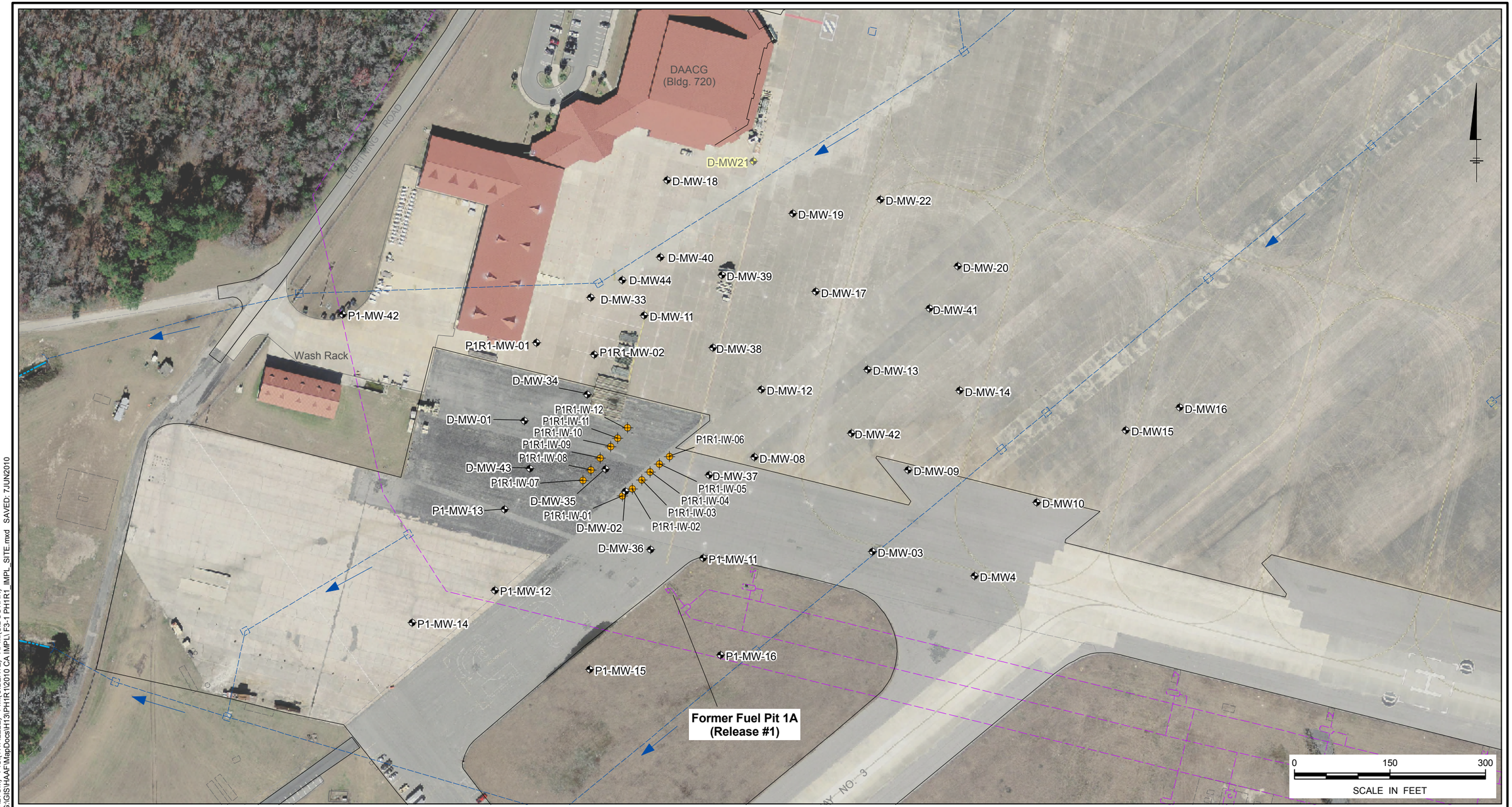
FIGURE
2-1



LEGEND

- Storm Water Drainage System
- Surface Water Flow Direction
- Former Fuel Transfer Line
- Monitor Well (shallow)
- Monitor Well (abandoned)
- Monitor Well (Installed 2010)
- Injection Well (Installed 2010)

REFERENCE: SAGIS (2008).

HUNTER ARMY AIRFIELD, GEORGIA
FORMER PUMPHOUSE #1 (RELEASE #1)
FORMER BUILDING 8060, FACILITY ID #9-025085
CORRECTIVE ACTION IMPLEMENTATION REPORT

Site Map

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FIGURE
3-1

CITY:(KNOXVILLE) DIV/GROUP:(ENV) DB:(B.ALTOM) PIC:(T.TALELE) PM:(C.BERTZ) APM:(S.BOSTIAN)
PROJECT: GP08HAFS.H13B.NBTR1 PATH: G:\GIS\HAAF\MapDocs\H13\PH1R12010 CA IMPL\ FS-1 PH1R1_IMPL_SITE.mxd SAVED: 7JUN2010

P1R1-MW-02	
Sample Date	3/29/2010
B	**330**
T	4,300
E	610
X	2,600

P1R1-MW-01	
Sample Date	3/29/2010
B	13
T	6.2
E	88
X	440

DAACG
(Bldg. 720)

Wash Rack

285

D-MW-18
D-MW-19
D-MW-22
D-MW-40
D-MW44
D-MW-39
D-MW-20
D-MW-33
D-MW-17
D-MW-41
D-MW-11
P1-MW-42
P1R1-MW-01
P1R1-MW-02
D-MW-38
D-MW-34
D-MW-13
D-MW-12
D-MW-14
D-MW16
D-MW-01
P1R1-IW-12
P1R1-IW-11
P1R1-IW-10
P1R1-IW-09
P1R1-IW-08
P1R1-IW-06
D-MW-42
D-MW15
D-MW-08
D-MW-43
P1R1-IW-07
D-MW-37
P1R1-IW-05
D-MW-09
D-MW-35
P1R1-IW-04
P1R1-IW-03
D-MW10
P1-MW-13
P1R1-IW-01
D-MW-02
P1R1-IW-02
D-MW-36
P1-MW-11
D-MW-03
D-MW4
P1-MW-12
P1-MW-14
P1-MW-16
P1-MW-15
Former Fuel Pit 1A
(Release #1)

0 150 300
SCALE IN FEET

LEGEND

- Storm Water Drainage System
- Surface Water Flow Direction
- Former Fuel Transfer Line
- Monitor Well (shallow)
- Injection Well
- Estimated Extent of Impacts above ACL
- Benzene Concentrations Exceeded ACL (285 µg/L) at least once in the past two years

ACRONYMS		IWQS	ACL
B	Benzene	51	285
T	Toluene	5,980	800,000
E	Ethylbenzene	2,100	114,800
X	Xylenes (total)	---	---

REFERENCE: SAGIS (2008).

NOTES:
1) Samples collected on March 29, 2010.
2) All concentrations reported in micrograms per liter (µg/L).
3) BTEX was analyzed by Method 8260B.
4) **BOLD** - Shaded concentration exceeds the Alternate Concentration Limit (ACL).

HUNTER ARMY AIRFIELD, GEORGIA
FORMER PUMPHOUSE #1 (RELEASE #1)
FORMER BUILDING 8060, FACILITY ID #9-025085
CORRECTIVE ACTION IMPLEMENTATION REPORT

Area Impacted Above ACL
(December 2007 – March 2010)

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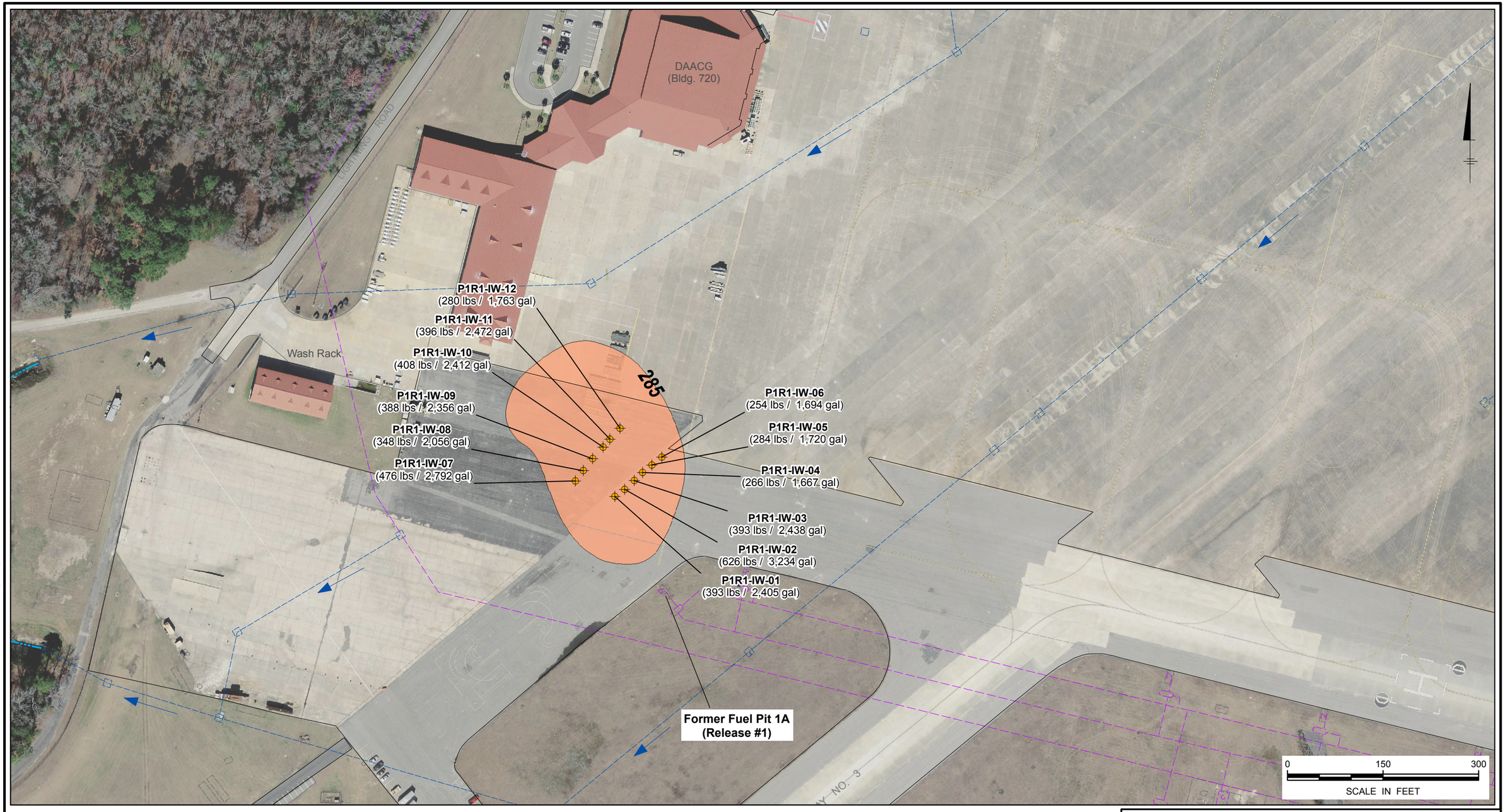
FIGURE
3-2

CITY:(KNOXVILLE) DIV/GROUP:(ENV) DB:(B.ALTOM) PIC:(T.TALELE) PM:(C.BERTZ) APM:(S.BOSTIAN)
PROJECT: GP08HAFS.H13B.NB1R1 PATH: G:\GIS\HAAF\MapDocs\H13\PH1R1\2010 CA IMPL\ F3-2 PH1R1_IMPL_IMPACT.mxd SAVED: 7-JUN2010



LEGEND

- Storm Water Drainage System
- Surface Water Flow Direction
- Former Fuel Transfer Line
- Injection Well
- Estimated Extent of Impacts above ACL (285 µg/L)

NOTES:
1) Benzene isopleth constructed from data obtained December 2007 through March 2010.
2) Calcium peroxide injection totals weight measured in pounds (lbs).
3) Total volume was measured in gallons (gal).

REFERENCE: SAGIS (2008).

HUNTER ARMY AIRFIELD, GEORGIA
FORMER PUMPHOUSE #1 (RELEASE #1)
FORMER BUILDING 8060, FACILITY ID #9-025085
CORRECTIVE ACTION IMPLEMENTATION REPORT

Calcium Peroxide Injection Totals (April 2010)

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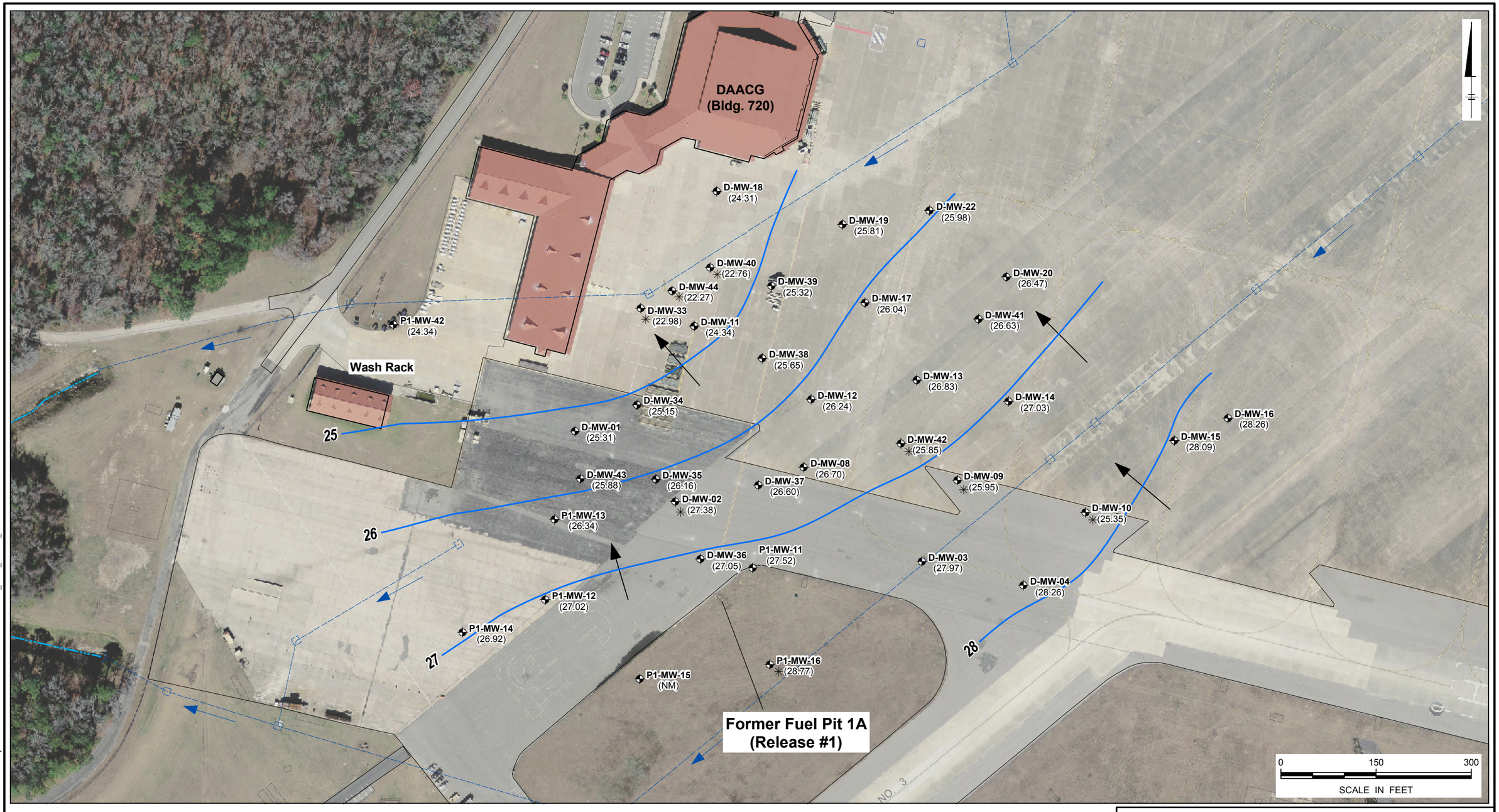
FIGURE
3-3

CITY:(KNOXVILLE) DIV/GROUP:(ENV) DB:(B.ALTOM) PIC:(T.TALELE) PM:(C.BERTZ) APM:(S.BOSTIAN)
PROJECT: GP08HAFS.H13B.NB1R1 PATH: G:\GIS\HAAF\MapDocs\H13\PH1R1\2010 CA IMPL\ F3-3 PH1R1_IMPL_INJ TOTALS.mxd SAVED: 10JUN2010



LEGEND

- Surface Water Drainage System
- Surface Water Drainage Canal
- Surface Water Flow Direction
- Monitor Well
- Potentiometric Contour (ft, amsl)
- Groundwater Flow Direction

(NM) Not Measured

(26.92) Water-Level Elevation, (ft, amsl) Measured December 7, 2009

✳ Not Used to Construct Contours

REFERENCE: SAGIS (2008).

HUNTER ARMY AIRFIELD, GEORGIA
FORMER PUMPHOUSE #1 (RELEASE #1)
FORMER BUILDING 8060, FACILITY ID #9-025085
CORRECTIVE ACTION IMPLEMENTATION REPORT

Groundwater Potentiometric Surface Map (December 2009)

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FIGURE
3-4

CITY:(KNOXVILLE) DIV/GROUP:(ENV) DB:(B.ALTOM) PIC:(T.TALELE) PM:(C.BERTZ) APM:(S.BOSTIAN)
PROJECT: GP08HAFS.H138.NB1R1 PATH: G:\GIS\HAAF\MapDocs\H13\P1\H1R1\2010 CA IMPL\ F3-4 P1H1R1_IMPL_200912_POT.mxd SAVED: 13JUL2010

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Appendix B

Tables

TABLE 3-1
PRE-INJECTION MONITORING DATA
Corrective Action Implementation Report
Former Pumphouse #1 (Release #1)
Former Building 8060
Hunter Army Airfield, Georgia

			Monitor Well ID:	P1R1-MW-01 (032910)	P1R1-MW-02 (032910)	P1R1-IW-02 (032910)	D-MW-02 (120909)
			Laboratory ID:	LC30036-001	LC30036-002	LC30036-003	KL11009-006
			Date Sampled:	3/29/2010	3/29/2010	3/29/2010	12/9/2009
			Well Screen Interval (ft bls):	5 - 15	5 - 15	5 - 20	7.6 - 17.6
Constituents	IWQS	ACL					
Field Parameters							
Temperature (^{o}C)	NE	NE		22.43	22.75	23.14	26.26
pH (Standard Units)	NE	NE		5.88	5.52	5.33	4.90
Dissolved Oxygen (mg/L)	NE	NE		0.49	0.98	0.25	0.30
Specific Conductance (µmhos/cm)	NE	NE		101	51	63	30
Turbidity (NTU)	NE	NE		9.40	6.41	9.44	1.26
Oxidation-Reduction Potential (mV)	NE	NE		-37.7	74.5	-26.3	NA
Volatile Organics (µg/L)							
(USEPA Method 8260B)							
Benzene	51	285		**13**	**330**	**250**	**150**
Ethylbenzene	5,980	800,000		**88**	**610**	**1,100**	**160**
Toluene	2,100	114,800		**6.2**	**4,300**	**28,000**	**1,400**
Xylenes (Total)	NE	NE		**440**	**2,600**	**5,600**	**840**
Metals (mg/L)							
Lead	0.03	NE		**0.0046 J**	**0.088**	**0.014**	**0.0081 J**

Notes:

IWQS	In-Stream Water Quality Standard.
ACL	Alternate Concentration Limit.
^{o}C	Degrees Celsius.
mg/L	Milligrams per liter.
µmhos/cm	Micromhos per centimeter.
NTU	Nephelometric Turbidity Units.
mV	Millivolts.
µg/L	Micrograms per liter.
mg/L	Milligrams per liter.
J	Constituent concentration was qualified as estimated.
NA	Not Analyzed.
NE	None established.
250	Constituent concentration exceeds the IWQS.
330	Constituent concentration exceeds the ACL.

Former Pumphouse #1 (Release #1)
Former Building 8060
Hunter Army Airfield, Georgia

Injection Well ID	Calcium Peroxide Injected (lbs)	Calcium Peroxide Solution Injected (gals)	Chase Water Injected (gals)	Total Volume Injected (gals)
P1R1-IW-01	393	1,858	547	2,405
P1R1-IW-02	626	2,604	630	3,234
P1R1-IW-03	393	1,839	599	2,438
P1R1-IW-04	266	1,145	521	1,666
P1R1-IW-05	284	1,217	503	1,720
P1R1-IW-06	254	1,106	588	1,694
P1R1-IW-07	476	2,004	789	2,793
P1R1-IW-08	348	1,388	668	2,056
P1R1-IW-09	388	1,589	767	2,356
P1R1-IW-10	408	1,689	723	2,412
P1R1-IW-11	396	1,687	785	2,472
P1R1-IW-12	280	1,195	568	1,763

Notes:

lbs	Pounds.
gals	Gallons.

TABLE 4-1
PROPOSED POST-INJECTION MONITORING PROGRAM
Corrective Action Implementation Report
Former Pumphouse #1 (Release #1)
Former Building 8060
Hunter Army Airfield, Georgia

LOCATION	QUARTER 1 (June 2010) WL	FP	TSS	COCs	QUARTER 2 (September 2010) WL	FP	TSS	COCs	Evaluate 2nd Calcium Peroxide Application
Injection Wells									
P1R1-IW-01	x				x				
P1R1-IW-02	x	x	x	x	x	x	x	x	
P1R1-IW-03	x				x				
P1R1-IW-04	x				x				
P1R1-IW-05	x				x				
P1R1-IW-06	x				x				
P1R1-IW-07	x				x				
P1R1-IW-08	x				x				
P1R1-IW-09	x				x				
P1R1-IW-10	x				x				
P1R1-IW-11	x				x				
P1R1-IW-12	x				x				
Monitor Wells									
D-MW-01	x	x		x	x	x		x	
D-MW-02	x	x	x	x	x	x	x	x	
D-MW-08	x				x				
D-MW-11	x				x				
D-MW-12	x				x				
D-MW-33	x				x				
D-MW-34	x	x		x	x	x		x	
D-MW-35	x	x	x	x	x	x	x	x	
D-MW-36	x	x		x	x	x		x	
D-MW-37	x	x		x	x	x		x	
D-MW-38	x				x				
D-MW-39	x				x				
D-MW-40	x				x				
D-MW-43	x	x		x	x	x		x	
D-MW-44	x				x				
P1-MW-11	x				x				
P1-MW-12	x				x				
P1-MW-13	x				x				
P1-MW-14	x				x				
P1-MW-15	x				x				
P1-MW-42	x				x				
P1R1-MW-01	x	x		x	x	x		x	
P1R1-MW-02	x	x		x	x	x		x	

Notes:

WL	Water Levels
FP	Field Parameters (temperature, pH, dissolved oxygen, conductivity, turbidity)
TSS	Total Suspended Solids
COCs	Constituents of Concern (benzene, toluene, ethylbenzene, xylene)
x	Parameter should be collected during monitoring event.

ARCADIS

Appendix C

Underground Injection Control Permit

FAX COVER SHEET

Georgia Department of Natural Resources
Environmental Protection Division, Watershed Protection Branch
Regulatory Support Program
Suite 400, Agriculture Building
19 Martin Luther King Jr. Drive, S.W.
Atlanta, GA 30334-9004
404-656-3214 - Phone; 404-463-6432 - Fax

Date: 4-5-10

To: Scott Bostian	Fax No.: 919-854-5448
Organization: Arcadis-US	Phone No:
From: Bijan	Total No. Of Pages: 6

Notes / Comments
UIC Permit # 440 for Pumphouse 1 - release

Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive, S.E., East Tower, Atlanta, Georgia 30334
Chris Clark, Commissioner
F. Allen Barnes, Director
Environmental Protection Division
(404) 656-4713

Reply To:
Regulatory Support Program
Suite 400
19 Martin Luther King Jr. Drive, S.W.
Atlanta, Georgia 30334
(404) 656-3214

March 31, 2010

Ms. Algeana Stevenson
Environmental Branch
Directorate of Public Works, Bldg. 1137
1587 Frank Cochran Drive
Fort Stewart, Georgia 31314-4927

RE: Underground Injection Control Permit #440 for injection of Calcium Peroxide, Pumphouse 1 Site, Hunter Army Airfield, Savannah, Georgia (EPD-UST Facility ID # 9025085-1).

Dear Ms. Stevenson:

Enclosed is Underground Injection Control (UIC) Permit #440 for the Hunter Army Airfield, Pumphouse 1 site located in Savannah, Georgia. This UIC permit allows the U. S. Army Corps of Engineers to utilize the injection of calcium peroxide through twelve (12) injection wells to assist with the remediation of soil and ground water contaminated with petroleum hydrocarbons at this site for up to five (5) years. The UIC permit states two (2) standard conditions and seven (7) additional conditions in the attachment.

If you have any questions about the permit, please contact Mr. Bijan Rahbar, UIC Coordinator, at (404) 656-3229.

Sincerely,

F. Allen Barnes
Director

Enclosure

cc: UIC Permit #440 File
Scott Bostian, Arcadis U.S., Inc.
William E. Logan, EPD-USTMP

STATE OF GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

INJECTION WELL OPERATING PERMIT

PERMIT NUMBER: #440 **DATE ISSUED: March 31, 2010**

FACILITY DATA: **INJECTION WELL TYPE: CLASS V (type 5X26)**

FACILITY: Hunter Army Airfield
Pumphouse 1
685 Horace Emmitt Wilson Blvd.
Savannah, GA
Chatham County

OPERATOR: U.S. Army Corps of Engineers
Directorate of Public Works,
Bldg. 1137
1587 Frank Cochran Drive
Fort Stewart, Georgia 31314-4927

LOCATION: Lat: 32° 00' 54" N
Long: 81° 08' 26" W

EPD-UST Facility ID # 9025085-1

In accordance with the provisions of the Georgia Rules for Underground Injection Control, Chapter 391-3-6-.13, as amended 2001, this permit is issued for the operation of the herein described injection system. This permit is effective immediately, unless appealed within thirty (30) days after its issuance and is conditioned upon the following:

1) The Permittee's continued compliance with the Georgia Rules for Underground Injection Control, Chapter 391-3-6-.13, the Georgia Rules for Water Quality Control (Revised) and the Georgia Rules for Safe Drinking Water (Revised); and

2) The Permittee's continued compliance with the Permittee's approved injection operation plan that is part of the approved Corrective Action Plan for this site, along with provisions of officially approved plan amendments, if any.

Additional conditions 1 through 7 are attached hereto.

This permit is issued in accordance with the application and supplemental information received on March 18, 2010. The injection operation plan was approved on March 31, 2010, and is based on the statements and supporting data entered herein or attached thereto, all of which are filed with the Environmental Protection Division of the Georgia Department of Natural Resources and hereby made a part of this permit.

This permit is subject to revocation for noncompliance with aforementioned conditions.
This permit expires on **March 30, 2015,** unless previously terminated.

F. Allen Barnes

F. Allen Barnes, Director, Environmental Protection Division
Georgia Department of Natural Resources

INJECTION WELL OPERATING PERMIT
ADDITIONAL CONDITIONS

1. Permit Conditions.

   a. This permit is not transferable until any new operator shall agree in writing to all permit conditions. Any new operator also shall provide the Environmental Protection Division (Division) with appropriate documentation that they have adequate financial assurances to plug all existing Class V wells.

   b. If the U.S. Army Corps of Engineers (Operator) wishes to continue an activity regulated by this permit after the expiration of the permit, the Operator must apply for and obtain a new permit.

   c. The Operator shall report any instances of noncompliance with permit conditions to the Division in writing within five (5) working days of such noncompliance, and shall take all reasonable steps to minimize the impact on the environment resulting from noncompliance with this permit and the Georgia Rules for Underground Injection Control.

   d. The Operator shall notify the Division of any proposed changes to the performance of the calcium peroxide injection system in writing at least thirty (30) days prior to the change.

   e. All reports submitted to the Division shall be signed and stamped by a Georgia Registered Professional Engineer or Professional Geologist.

   f. All analyses shall be performed by a laboratory approved or accredited by EPD in accordance with the Georgia Rules for Commercial Laboratory Accreditation, Chapter 391-3-26.

2. System Parameters.

   a. This permit is issued to the Operator for the purpose of operating a calcium peroxide injection system at the above referenced site to aid in remediation of soil and ground water contaminated with petroleum hydrocarbons.

   b. Number of Class V injection wells: twelve (12).

   c. Injected fluid: calcium peroxide.

   d. Maximum injection rate per well: 10 gallons of liquid/min. (gpm)/well.
   Maximum total system injection rate: 120 gpm.

   e. Maximum injection volume per well: 7,050 gallons of liquid/well/day.
   Maximum total system injection volume: 84,600 gallons/day.

   f. Maximum daily average injection pressure (at well head): 10 psi.

Additional Conditions, UIC Permit #440, March 31, 2010, cont.

3. Monitoring and Reporting Requirements.

   a. The Operator shall report to the Underground Injection Control Program of the Division the number and exact location of all Class V injection wells it installs or plugs on a quarterly basis. The reports are to be submitted to the UIC Program in accordance with the reporting schedule stipulated by the Underground Storage Tank Management Program.

   b. The Operator shall submit to the Division for its approval, a detailed schematic diagram and location map on any Class V injection well that is different in construction from the specifications contained in the UIC permit application, no later than 45 days prior to installation of the injection well. The Operator cannot install such a well until it receives approval from the Division.

   c. The Operator shall submit to the UIC Program one (1) copy of any report regarding this site that the Operator is required to submit to the Underground Storage Tank Management Program, or any other program within the Division.

   d. The Operator shall submit to the UIC Program an annual report that will contain the following information.

      1. Status of the injection system operation;

      2. Results of any ground-water sampling and analyses;

      3. Results of any soil sampling and analyses;

      4. An evaluation of the plume movement through the ground water, if any;

      5. Comparisons of analyses to determine any changes in pollutant concentrations.

      The annual reports will be provided to the UIC Program in accordance with the schedule stipulated by the Underground Storage Tank Management Program.

4. Emergency Situations.

   a. The Operator is to immediately notify the Division of any emergency situation that affects the injection system and describe the remedial activity that the Operator is utilizing to correct the situation.

   b. The Operator is to immediately notify the Division when the emergency situation ceases to exist.

5. The Operator shall grant the Division permission to enter the facility property to conduct inspections of the injection system.

6. The Operator shall maintain a copy of this permit at the facility site.

Additional Conditions, UIC Permit #440, March 31, 2010, cont.

7. The Operator shall, upon termination of the injection of calcium peroxide through twelve (12) Class V injection wells at this site, properly plug and abandon all Class V wells constructed on this site in accordance with EPD's *Manual for Groundwater Monitoring* (September 1991) and notify the division within thirty (30) days of such termination and abandonment.

ARCADIS

Appendix D

Injection and Monitor Well Logs

Project: HAA-13 Pumphouse 1 Release 1

Page___1_ of__1___

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-MW-01	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

Intervals (ft BGS)
Riser: 0-5
Screen: 5 - 15
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-15
Backfill: 15-20

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: #2 Sand

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact: ----------

Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1615 End: 1645			
0			Hand Auger			
			0-1.2- Concrete	2.0		0.1
1			1.2-2.0- Lt. brown and brown loose, well sorted silty fine-grained SAND, moist			
2			2.0-5.0- Same as above, moist	3.0		0.7
3						
4						
5			Geoprobe			
			5.0-9.5- loose, lt. brown to lt. gray well sorted fine grained silty SAND, moist to very moist	4.5		0.4
6						
7						
8						
9						
10						
			10.0-15.0- loose, lt. gray/brown well sorted fine grained silty SAND, wet throughout	5.0		2.0
11						
12						
13						
14						
15						
			15.0-20.0- loose, light brown well sorted fine-grained SAND, little silt, wet.	5.0		1.4
16						
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page___1_ of__1___

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-MW-02	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Boring Dia. "

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

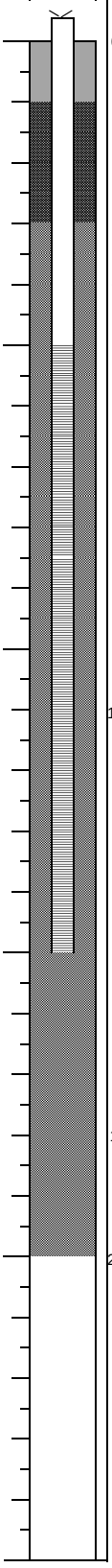
Intervals (ft BGS)
Riser: 0-5
Screen: 5 - 15
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-15
Backfill: 15-20

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: #2 Sand

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact: ----------



Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1645 End: 1715			
0			Hand Auger			
			0-1.0- Concrete	2.0		17.3
1			1.0-2.0- loose, lt. gray well sorted silty SAND, sl. Moist			
2			2.0-5.0- Same as above, some lt. brown coloring	3.0		18.7
3						
4						
5			Geoprobe			
			5.0-8.5- loose, lt. brown to lt. gray well sorted fine grained SAND, little silt, sl. Moist	3.5		9.2
6						
7						
8						
9						
10						
			10.0-10.9- Same as above, moist	5.0		120
11			10.9-15.0- Loose, lt. gray well sorted fine grained silty SAND, wet			
12						
13						
14						
15						
			15.0-20.0 - Loose, lt. gray to lt. brown well sorted fine grained silty SAND, wet	5.0		15.8
16						
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page___1_ of__1___

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-01	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/10/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/10/2010
End: 3/19/2010

Construction

Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: JDF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:

Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1015 End: 1100			
0			Hand Auger			
			~8" asphalt over 8" concrete	2.0		NM
1						
2			10 YR 7/2 light gray silty well sorted fine SAND	3.0		NM
3						
4						
5			Geoprobe			
			10 YR 6/2 light brownish gray silty well sorted fine SAND, fuel odor	5.0		NM
6						
7						
			7.5 YR 3/3 dark brown silty well sorted fine SAND fuel odor			
8			10 YR 6/2 silty to clayey well sorted fine SAND, slight plasticity, slight fuel odor			
9						
10						
			10 YR 7/2 light gray silty well sorted fine SAND, slight fuel odor	5.0		NM
11						
12						
13						
14						
15				5.0		NM
16						
17						
18			10 YR 6/3 pale brown silty well sorted fine SAND			
19						
20			End of Boring at 20.0 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page 1 of 1

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-02	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/10/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. ___"

Time
Begin: 3/10/2010
End: 3/19/2010

Construction

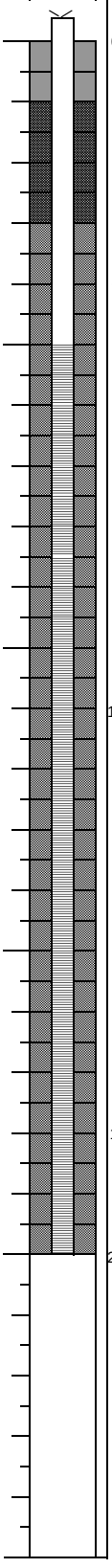
Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: JDF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:



Borehole Log

Time
Begin: 1110
End: 1200

Depth (ft)	Spl Run	Class	Description	Ft. Rec.	Blow Count	PID (ppm)
0			Hand Auger			
			~8" asphalt over 8" concrete	2.0		NM
1						
2			10 YR 5/6 yellowish brown silty well sorted fine SAND			
				3.0		NM
3						
4						
5			Geoprobe			
				5.0		NM
6						
7						
8			7.5 YR 4/4 brown sorted fine SAND			
9			10 YR 5/2 grayish brown clayey well sorted fine SAND, slight plasticity, fuel odor			
10			10 YR 7/2 light gray well sorted silty fine SAND, fuel odor			
				5.0		NM
11						
12						
13						
14						
15						
				5.0		NM
16						
17						
18						
19						
20			End of Boring at 20.0 feet.			
21						
22						
23						
24						
25						

Borehole and Well Construction Log

Project: HAA-13 Pumphouse 1 Release 1 | Page 1 of 1

Project No. GP08HAFS.H13B.KG1R1 | Site Location: Savannah, GA

Well ID	P1R1-IW-03	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:

Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1530 End: 1605			
0			Hand Auger			
			0-1.0- asphalt/concrete	2.0		1341
1			1.0-2.0- loose, dk. Brown well sorted fine grained silty SAND, sl. Odor, sl. Moist			
2				3.0		1643
3			2.0-5.0- Same as above, brown color, sl. Moist			
4						
5			Geoprobe			
			5.0-8.0- Same as above, gray/brown throughout	3.0		1204
6			silt w/ depth, some rootlets present from ~ 7.0 to 7.5 feet; moist			
7						
8						
9						
10			10.0-13.0- loose, lt. gray well sorted fine grained silty SAND, wet thoughout	3.0		1340
11						
12						
13						
14						
15			15.0-19.5- Same as above, wet throughout	4.5		1204
16						
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page 1 of 1

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-04	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

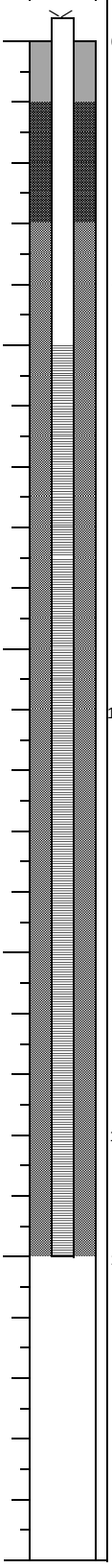
Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:



Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1505 End: 1530			
0			Hand Auger			
			0-1.0- asphalt/concrete	2.0		1596
1						
			1.0-2.0- loose, gray/brown well sorted fine grained silty SAND, sl. Moist			
2				2.0		805
3			2.0-5.0- Same as above, gray color, less silt			
4						
5			Geoprobe			
				3.0		1736
6			5.0-8.0- Same as above, lt. brown, fig. silty SAND, well sorted, sl. Moist			
7						
8						
9						
10				3.5		639
11			10-11.5- Same as above, some clay. Soft to mod stiff, sl. Moist			
12						
13			11.5-13.5- loose, lt. gray well sorted fine grained SAND, some silt, wet			
14						
15			15.0-20.0- Same as above, grading to brown silt with depth, silty SAND	5.0		119
16						
17						
18						
19						
20			End of Boring at 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page 1 of 1

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location: Savannah, GA

Well ID	P1R1-IW-05	Contractor/Driller	ARM Environmental Aervices, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:

Borehole Log

Time
Begin: 1435
End: 1500

Depth (ft)	Spl Run	Class	Description	Ft. Rec.	Blow Count	PID (ppm)
0			Hand Auger			
			0-1.0- asphalt/concrete	2.0		464
1			1.0-2.0- loose, lt. brown fine well sorted silty SAND, moist			
2				3.0		365
3			2.0-5.0- Same as above, becoming gray with depth			
4						
5			Geoprobe			
			5.0-8.1- Loose, well sorted, fine grained silty SAND, lt. brown:	3.1		902
6			some reddish hues b/w 6.5 and 7.5 feet, moist			
7						
8						
9						
10			10-12.0- Same as above, lt. brown, loose, wet @ 11.0	5.0		1445
11						
12			12.0-13.5- soft, lt. gray silty CLAY, trace sand, some iron oxidation, very moist			
13						
14			13.5-15.0- loose, lt. gray fine-grained well sorted, some silt, wet			
15			15.0-20.0- loose, lt. gray fine-grained well sorted silty SAND becoming lt. brown with depth	5.0		33.6
16						
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page 1 of 1

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-06	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/10/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/10/2010
End: 3/19/2010

Construction

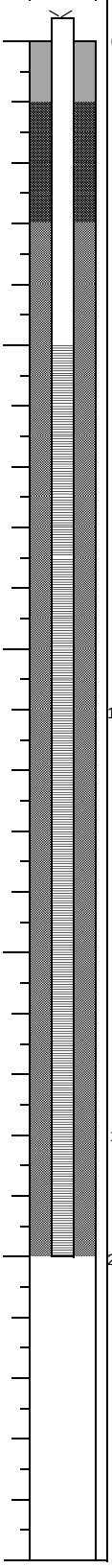
Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: JDF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:



Borehole Log

Depth (ft)	Spl Run	Class	Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 920 End: 1000			
0			Hand Auger			
			~6" asphalt over ~8" concrete	2.0		NM
1			10 YR 5/4 yellowish brown silty well sorted fine SAND, slight chemical odor			
2				3.0		NM
3						
4						
5			Geoprobe			
			10 YR 8/2 very pale brown silty well sorted fine SAND	5.0		NM
6						
7						
8			10 YR 7/1 light grey very firm high plasticity CLAY			
9						
10				5.0		NM
11						
12						
13						
14						
15			10 YR 6/4 light yellowish brown silty well sorted fine-grained SAND	5.0		NM
16						
17						
18			10 YR 7/1 light gray silty well sorted fine-grained SAND			
19						
20			End of Boring at 20 feet.			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location: Savannah, GA

Well ID	P1R1-IW-07	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:

Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1000 End: 1025			
0			Hand Auger			
			0-0.9- asphalt/concrete	2.0		810
1			0.9-2.0- loose, lt. brown/black well sorted fine-grained SAND, sl. Moist, odor			
2			2-4- Same as above	3.0		603
3						
4						
5			Geoprobe			
			5.0-8.5- loose, lt gray fine-grained SAND, well sorted;	3.5		1470
6			some silt from 7.5 to 8.5; increased moisture with depth			
7						
8						
9						
10			10-15.0- loose lt. gray fine-grained SAND, little silt, wet throughout, strong odor	5.0		1217
11						
12						
13						
14						
15			15.0-19.0- Same as above, grading to a light brown with depth, wet throughout	4.0		1883
16						
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page 1 of 1

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-08	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 1030
End: 1055

Construction

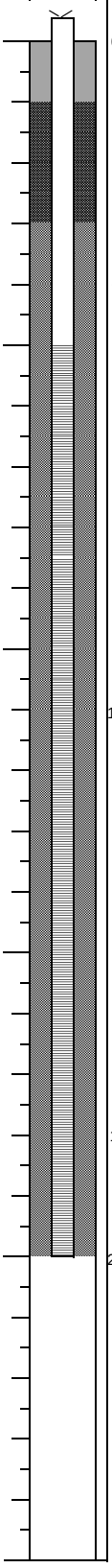
Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:



Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1030 End: 1055			
0			Hand Auger			
			0-1.0- asphalt/concrete	2.0		12.6
1			1.0-2.0- loose, lt. brown silty fine-grained SAND, moist			
2				3.0		427
3			2.0-5.0- Same as above, some gray sand present, sl. Odor			
4						
5			Geoprobe			
			5.0-8.8- Same as above, lt. brown/tan from 5.0 to 6.0; lt. gray to 8.8 feet	3.8		1758
6			increasing amounts of silt from 7.8 to 8.8 feet, very moist throughout, odor			
7						
8						
9						
10			10.0-15.0- loose lt. gray fine-grained SAND little silt, wet, strong odor	5.0		1341
11						
12						
13						
14						
15			15.0-20.0- loose lt. gray fine-grained SAND little silt, wet,	5.0		286
16			strong odor, becoming lt. brown with depth			
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page 1 of 1

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-09	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

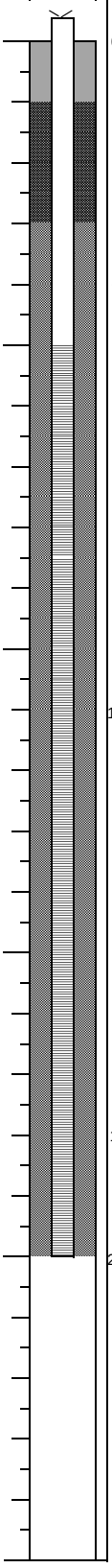
Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:



Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1105 End: 1128			
0			Hand Auger			
			0.0-1.0- asphalt/concrete	2.0		432
1			1.0-2.0- loose, lt. brown well sorted fine-grained SAND, little silt, moist			
2				3.0		296
3			2.0-5.0- Same as above, some gray coloring			
4						
5			Geoprobe			
			5.0-8.0- Same as above, little silt throughout, loose, very moist with depth	3.0		1455
6						
7						
8						
9						
10						
			10.0-15.0- loose, lt. gray fine-grained silty SAND, wet, odor, well sorted	5.0		1064
11						
12						
13						
14						
15						
			15.0-19.5- Same as above, becoming lt. brown with depth, wet, little odor, well sorted	4.5		64.5
16						
17						
18						
19						
20			End of Boring at 20.0 feet.			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

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Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-10	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

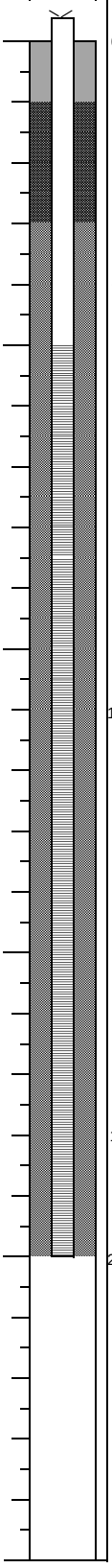
Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:



Borehole Log

Time
Begin: 1130
End: 1155

Depth (ft)	Spl Run	Class	Description	Ft. Rec.	Blow Count	PID (ppm)
0			Hand Auger			
			0-1.0- asphalt/concrete	2.0		385
1			1.0-2.0- loose brown to light brown fine grained silty SAND, well sorted, moist			
2				3.0		183
3			2.0-5.0- Same as above, becoming gray			
4						
5			Geoprobe			
			5.0-8.5- loose, lt. gray fine-grained well sorted silty SAND;	3.5		917
6			moist, little brown coloring throughout			
7						
8						
9						
10						
			10.0-14.0- loose, lt. gray and brown silty SAND, fine-grained, well sorted;	4.0		1732
11			wet from 11.0-14.0 feet			
12						
13						
14						
15						
			15.0-20.0- loose, lt gray to brown well sorted, fine grained silty SAND; wet throughout	5.0		29.4
16						
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Borehole and Well Construction Log

Project: HAA-13 Pumphouse 1 Release 1 | Page 1 of 1

Project No. GP08HAFS.H13B.KG1R1 | Site Location: Savannah, GA

Well ID	P1R1-IW-11	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/15/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/15/2010
End: 3/19/2010

Construction

Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: CCF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact:

Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 1200 End: 1230			
0			Hand Auger			
			0-1.0- asphalt/concrete	2.0		826
1			1.0-2.0- loose, gray/ black sandy FILL some gravel, cinders, glass; moist			
2			2.0-5.0- loose, brown/gray well sorted fine grained silty SAND; moist	3.0		909
3						
4						
5			Geoprobe			
			5.0-8.0- loose, lt. brown well sorted fine grained SAND, some silt, sl. Moist;	3.0		1854
6			becoming gray from 7.0-8.0 feet			
7						
8						
9						
10			10.0-14.0- loose, lt. gray well sorted silty SAND (fine grained);	4.0		1653
11			sl. Brown coloration from 13.0-14.0 feet; wet from 11.0-14.0 feet			
12						
13						
14						
15			15.0-20.0- loose, lt. brown well sorted fine grained silty SAND, wet throughout	5.0		41.1
16						
17						
18						
19						
20			End of Boring @ 20 feet			
21						
22						
23						
24						
25						

Project: HAA-13 Pumphouse 1 Release 1

Page___1_ of__1___

Borehole and Well Construction Log

Project No. GP08HAFS.H13B.KG1R1

Site Location Savannah, GA

Well ID	P1R1-IW-12	Contractor/Driller	ARM Environmental Services, Inc.	Total Depth Drilled	20'
Date Begin	3/10/2010	Rig Type	Geoprobe	Sample Method/Size	5-foot Macrocore
Date End	3/19/2010	Method	Hollow Stem Auger with DPT Lithology	Cutting Disposal	Drum

Well Construction Log

Boring Dia. 8"

Time
Begin: 3/10/2010
End: 3/19/2010

Construction

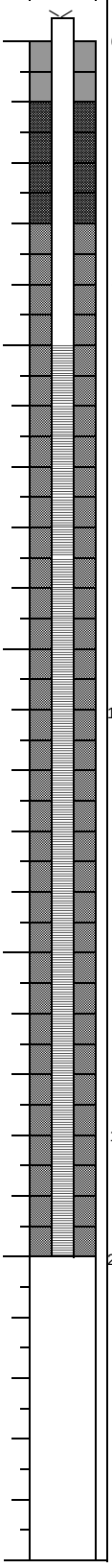
Intervals (ft BGS)
Riser: 0-5
Screen: 5-20
Surf. Seal: 0-1
Seal: 1-3
Filter Pack: 3-20
Backfill: None

Materials
Riser: 2" sch. 40 PVC
Screen: 10-slot PVC
Surf. Seal: Cement Grout
Seal: Bentonite Pellets
Filter Pack: #2 Sand
Backfill: None

Surface Completion
Protection: Flush Mount Manhole
Pad: Concrete
Lock: N/A
Date/Time: 3/19/2010

ARCADIS G&M Personel
Field Work: JDF
Log Draft:

Symbols
Grout:
Bentonite:
Sand:
Gravel:
Backfill: X
Contact:
Implied or Gradational Contact: ----------



Depth (ft)	Spl Run	Class	Borehole Log Description	Ft. Rec.	Blow Count	PID (ppm)
			Time Begin: 820 End: 912			
0			Hand Auger			
			~18" thick asphalt	2.0		NM
1						
			10 YR 7/6 yellow well sorted silty fine SAND; faint chemical odor			
2				3.0		NM
3						
4			7.5 YR 7/6 reddish yellow well sorted silty fine SAND			
			Geoprobe			
5			10 YR 7/3 very pale brown well sorted silty fine SAND	5.0		NM
6						
7						
8						
9			10 YR 8/2 very pale brown silty well sorted fine SAND, strong fuel odor			
10				5.0		NM
11						
12						
13						
14						
15			10 YR 7/1 light gray silty well sorted fine SAND, fuel odor	5.0		NM
16						
17						
18						
19			Same as above, grades to 10 YR 7/3 very pale brown			
20			End of Boring at 20.0 feet			
21						
22						
23						
24						
25						

ARCADIS

Appendix E

Laboratory Analytical Reports

SHEALY ENVIRONMENTAL SERVICES, INC.

Report of Analysis

ARCADIS U.S., Inc.
30 Patewood Drive
Suite 155
Greenville, SC 29615
Attention: Chase Forman

Project Name: **HAAF- PH1R1**

Project Number: **GP08HAFS.H13B.KG1R1**

Lot Number: **LC30036**

Date Completed: **04/05/2010**

Nisreen Saikaly
Project Manager

The following non-paginated documents are considered part of this report: Chain of Custody Record and Sample Receipt Checklist.

* L C 3 0 0 3 6 *

Case Narrative
ARCADIS U.S., Inc.
Lot Number: LC30036

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved NELAC standards, the Shealy Environmental Services, Inc. ("Shealy") Quality Assurance Management Plan (QAMP), standard operating procedures (SOPs), and Shealy policies. Any exceptions to the NELAC standards, the QAMP, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Shealy Project Manager listed on the cover page.

Sample Summary
ARCADIS U.S., Inc.
Lot Number: LC30036

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	P1R1-MW-01 (032910)	Aqueous	03/29/2010 1653	03/30/2010
002	P1R1-MW-02 (032910)	Aqueous	03/29/2010 1627	03/30/2010
003	P1R1-IW-02 (032910)	Aqueous	03/29/2010 1830	03/30/2010
004	TB (032910)	Aqueous	03/30/2010 0845	03/30/2010

(4 samples)

Executive Summary

ARCADIS U.S., Inc.

Lot Number: LC30036

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	P1R1-MW-01 (032910)	Aqueous	Benzene	8260B	13		ug/L	5
001	P1R1-MW-01 (032910)	Aqueous	Ethylbenzene	8260B	88		ug/L	5
001	P1R1-MW-01 (032910)	Aqueous	Toluene	8260B	6.2		ug/L	5
001	P1R1-MW-01 (032910)	Aqueous	Xylenes (total)	8260B	440		ug/L	5
001	P1R1-MW-01 (032910)	Aqueous	Lead	6010C	0.0046	J	mg/L	6
002	P1R1-MW-02 (032910)	Aqueous	Benzene	8260B	330		ug/L	7
002	P1R1-MW-02 (032910)	Aqueous	Ethylbenzene	8260B	610		ug/L	7
002	P1R1-MW-02 (032910)	Aqueous	Toluene	8260B	4300		ug/L	7
002	P1R1-MW-02 (032910)	Aqueous	Xylenes (total)	8260B	2600		ug/L	7
002	P1R1-MW-02 (032910)	Aqueous	Lead	6010C	0.088		mg/L	8
003	P1R1-IW-02 (032910)	Aqueous	Benzene	8260B	250		ug/L	9
003	P1R1-IW-02 (032910)	Aqueous	Ethylbenzene	8260B	1100		ug/L	9
003	P1R1-IW-02 (032910)	Aqueous	Toluene	8260B	28000		ug/L	9
003	P1R1-IW-02 (032910)	Aqueous	Xylenes (total)	8260B	5600		ug/L	9
003	P1R1-IW-02 (032910)	Aqueous	Lead	6010C	0.014		mg/L	10

(15 detections)

Volatile Organic Compounds by GC/MS

Client: **ARCADIS U.S., Inc.**
Laboratory ID: **LC30036-001**
Description: **P1R1-MW-01 (032910)**
Matrix: **Aqueous**
Date Sampled: **03/29/2010 1653**
Date Received: **03/30/2010**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260B	1	04/01/2010 1929	DLB		30782

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Benzene	**71-43-2**	**8260B**	**13**		**0.50**	**0.027**	**ug/L**	**1**
Ethylbenzene	**100-41-4**	**8260B**	**88**		**0.50**	**0.17**	**ug/L**	**1**
Toluene	**108-88-3**	**8260B**	**6.2**		**0.50**	**0.17**	**ug/L**	**1**
Xylenes (total)	**1330-20-7**	**8260B**	**440**		**0.50**	**0.17**	**ug/L**	**1**

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
1,2-Dichloroethane-d4		85	70-130
Bromofluorobenzene		103	70-130
Toluene-d8		96	70-130

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria
H = Out of holding time

ICP-AES

Client: **ARCADIS U.S., Inc.**
Laboratory ID: **LC30036-001**
Description: **P1R1-MW-01 (032910)**
Matrix: **Aqueous**
Date Sampled: **03/29/2010 1653**
Date Received: **03/30/2010**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	03/31/2010 0013	CDF	03/30/2010 1820	30528

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Lead	**7439-92-1**	**6010C**	**0.0046**	**J**	**0.010**	**0.0019**	**mg/L**	**1**

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria
H = Out of holding time

Volatile Organic Compounds by GC/MS

Client: **ARCADIS U.S., Inc.**
Laboratory ID: **LC30036-002**
Description: **P1R1-MW-02 (032910)**
Matrix: **Aqueous**
Date Sampled: **03/29/2010 1627**
Date Received: **03/30/2010**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260B	20	04/01/2010 1719	DLB		30782

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Benzene	**71-43-2**	**8260B**	**330**		**10**	**0.54**	**ug/L**	**1**
Ethylbenzene	**100-41-4**	**8260B**	**610**		**10**	**3.4**	**ug/L**	**1**
Toluene	**108-88-3**	**8260B**	**4300**		**10**	**3.4**	**ug/L**	**1**
Xylenes (total)	**1330-20-7**	**8260B**	**2600**		**10**	**3.4**	**ug/L**	**1**

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
1,2-Dichloroethane-d4		87	70-130
Bromofluorobenzene		101	70-130
Toluene-d8		96	70-130

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria
H = Out of holding time

ICP-AES

Client: **ARCADIS U.S., Inc.**
Laboratory ID: **LC30036-002**
Description: **P1R1-MW-02 (032910)**
Matrix: **Aqueous**
Date Sampled: **03/29/2010 1627**
Date Received: **03/30/2010**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	03/31/2010 0017	CDF	03/30/2010 1820	30528

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Lead	**7439-92-1**	**6010C**	**0.088**		**0.010**	**0.0019**	**mg/L**	**1**

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria
H = Out of holding time

Volatile Organic Compounds by GC/MS

Client: **ARCADIS U.S., Inc.**
Laboratory ID: **LC30036-003**
Description: **P1R1-IW-02 (032910)**
Matrix: **Aqueous**
Date Sampled: **03/29/2010 1830**
Date Received: **03/30/2010**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260B	50	04/01/2010 1741	DLB		30782
2	5030B	8260B	100	04/02/2010 2315	LBS		30899

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Benzene	**71-43-2**	**8260B**	**250**		**25**	**1.4**	**ug/L**	**1**
Ethylbenzene	**100-41-4**	**8260B**	**1100**		**25**	**8.5**	**ug/L**	**1**
Toluene	**108-88-3**	**8260B**	**28000**		**50**	**17**	**ug/L**	**2**
Xylenes (total)	**1330-20-7**	**8260B**	**5600**		**25**	**8.5**	**ug/L**	**1**

Surrogate	Q	Run 1 % Recovery	Acceptance Limits	Q	Run 2 % Recovery	Acceptance Limits
1,2-Dichloroethane-d4		87	70-130		110	70-130
Bromofluorobenzene		101	70-130		100	70-130
Toluene-d8		97	70-130		108	70-130

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria
H = Out of holding time

ICP-AES

Client: **ARCADIS U.S., Inc.**
Laboratory ID: **LC30036-003**
Description: **P1R1-IW-02 (032910)**
Matrix: **Aqueous**
Date Sampled: **03/29/2010 1830**
Date Received: **03/30/2010**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	03/31/2010 0046	CDF	03/30/2010 1820	30528

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Lead	**7439-92-1**	**6010C**	**0.014**		**0.010**	**0.0019**	**mg/L**	**1**

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria
H = Out of holding time

Volatile Organic Compounds by GC/MS

Client: **ARCADIS U.S., Inc.**
Laboratory ID: **LC30036-004**
Description: **TB (032910)**
Matrix: **Aqueous**
Date Sampled: **03/30/2010 0845**
Date Received: **03/30/2010**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260B	1	04/01/2010 0658	DLB		30698

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Benzene	71-43-2	8260B	ND		0.50	0.027	ug/L	1
Ethylbenzene	100-41-4	8260B	ND		0.50	0.17	ug/L	1
Toluene	108-88-3	8260B	ND		0.50	0.17	ug/L	1
Xylenes (total)	1330-20-7	8260B	ND		0.50	0.17	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
1,2-Dichloroethane-d4		113	70-130
Bromofluorobenzene		94	70-130
Toluene-d8		110	70-130

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria
H = Out of holding time

QC Summary

Volatile Organic Compounds by GC/MS - MB

Sample ID: LQ30698-001
Batch: 30698
Analytical Method: 8260B
Matrix: Aqueous
Prep Method: 5030B

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Benzene	ND		1	0.50	0.027	ug/L	04/01/2010 0301
Ethylbenzene	ND		1	0.50	0.17	ug/L	04/01/2010 0301
Toluene	ND		1	0.50	0.17	ug/L	04/01/2010 0301
Xylenes (total)	ND		1	0.50	0.17	ug/L	04/01/2010 0301

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		93	70-130
1,2-Dichloroethane-d4		114	70-130
Toluene-d8		109	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - LCS

Sample ID: LQ30698-002
Batch: 30698
Analytical Method: 8260B
Matrix: Aqueous
Prep Method: 5030B

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Benzene	50	56		1	111	70-130	04/01/2010 0134
Ethylbenzene	50	54		1	108	70-130	04/01/2010 0134
Toluene	50	56		1	111	70-130	04/01/2010 0134
Xylenes (total)	100	100		1	105	70-130	04/01/2010 0134

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		99	70-130
1,2-Dichloroethane-d4		110	70-130
Toluene-d8		110	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - LCSD

Sample ID: LQ30698-003
Batch: 30698
Analytical Method: 8260B

Matrix: Aqueous
Prep Method: 5030B

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Benzene	50	55		1	109	1.6	70-130	20	04/01/2010 0155
Ethylbenzene	50	54		1	108	0.30	70-130	20	04/01/2010 0155
Toluene	50	56		1	112	0.85	70-130	20	04/01/2010 0155
Xylenes (total)	100	110		1	106	1.1	70-130	20	04/01/2010 0155

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		101	70-130
1,2-Dichloroethane-d4		109	70-130
Toluene-d8		111	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - MB

Sample ID: LQ30782-001
Batch: 30782
Analytical Method: 8260B
Matrix: Aqueous
Prep Method: 5030B

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Benzene	ND		1	0.50	0.027	ug/L	04/01/2010 1142
Ethylbenzene	ND		1	0.50	0.17	ug/L	04/01/2010 1142
Toluene	ND		1	0.50	0.17	ug/L	04/01/2010 1142
Xylenes (total)	ND		1	0.50	0.17	ug/L	04/01/2010 1142

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		101	70-130
1,2-Dichloroethane-d4		87	70-130
Toluene-d8		97	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - LCS

Sample ID: LQ30782-002
Batch: 30782
Analytical Method: 8260B

Matrix: Aqueous
Prep Method: 5030B

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Benzene	50	48		1	96	70-130	04/01/2010 1015
Ethylbenzene	50	51		1	101	70-130	04/01/2010 1015
Toluene	50	50		1	99	70-130	04/01/2010 1015
Xylenes (total)	100	100		1	103	70-130	04/01/2010 1015

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		103	70-130
1,2-Dichloroethane-d4		91	70-130
Toluene-d8		98	70-130

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

P = The RPD between two GC columns exceeds 40%

J = Estimated result < PQL and ≥ MDL

N - Recovery is out of criteria

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - LCSD

Sample ID: LQ30782-003
Batch: 30782
Analytical Method: 8260B
Matrix: Aqueous
Prep Method: 5030B

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Benzene	50	49		1	98	1.3	70-130	20	04/01/2010 1036
Ethylbenzene	50	51		1	102	0.68	70-130	20	04/01/2010 1036
Toluene	50	51		1	102	2.5	70-130	20	04/01/2010 1036
Xylenes (total)	100	100		1	105	1.4	70-130	20	04/01/2010 1036

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		103	70-130
1,2-Dichloroethane-d4		90	70-130
Toluene-d8		99	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - MB

Sample ID: LQ30899-001
Batch: 30899
Analytical Method: 8260B
Matrix: Aqueous
Prep Method: 5030B

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Toluene	ND		1	0.50	0.17	ug/L	04/02/2010 1527

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		95	70-130
1,2-Dichloroethane-d4		109	70-130
Toluene-d8		106	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - LCS

Sample ID: LQ30899-002
Batch: 30899
Analytical Method: 8260B
Matrix: Aqueous
Prep Method: 5030B

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Toluene	50	51		1	103	70-130	04/02/2010 1359

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		101	70-130
1,2-Dichloroethane-d4		106	70-130
Toluene-d8		108	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Volatile Organic Compounds by GC/MS - LCSD

Sample ID: LQ30899-003
Batch: 30899
Analytical Method: 8260B
Matrix: Aqueous
Prep Method: 5030B

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Toluene	50	53		1	105	2.5	70-130	20	04/02/2010 1421

Surrogate	Q	% Rec	Acceptance Limit
Bromofluorobenzene		100	70-130
1,2-Dichloroethane-d4		105	70-130
Toluene-d8		109	70-130

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MB

Sample ID: LQ30528-001
Batch: 30528
Analytical Method: 6010C
Matrix: Aqueous
Prep Method: 3005A
Prep Date: 03/30/2010 1820

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Lead	ND		1	0.010	0.0019	mg/L	03/30/2010 2252

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - LCS

Sample ID: LQ30528-002
Batch: 30528
Analytical Method: 6010C
Matrix: Aqueous
Prep Method: 3005A
Prep Date: 03/30/2010 1820

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Lead	0.40	0.42		1	104	80-120	03/30/2010 2256

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - LCSD

Sample ID: LQ30528-003
Batch: 30528
Analytical Method: 6010C
Matrix: Aqueous
Prep Method: 3005A
Prep Date: 03/30/2010 1820

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Lead	0.40	0.42		1	104	0.18	80-120	20	03/30/2010 2301

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MS

Sample ID: LC30036-002MS
Batch: 30528
Analytical Method: 6010C
Matrix: Aqueous
Prep Method: 3005A
Prep Date: 03/30/2010 1820

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Lead	0.088	0.40	0.51		1	105	75-125	03/31/2010 0022

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MSD

Sample ID: LC30036-002MD
Batch: 30528
Analytical Method: 6010C
Matrix: Aqueous
Prep Method: 3005A
Prep Date: 03/30/2010 1820

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Lead	0.088	0.40	0.51		1	104	0.25	75-125	20	03/31/2010 0027

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MS

Sample ID: LC30036-003MS
Batch: 30528
Analytical Method: 6010C
Matrix: Aqueous
Prep Method: 3005A
Prep Date: 03/30/2010 1820

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Lead	0.014	0.40	0.43		1	105	75-125	03/31/2010 0051

PQL = Practical quantitation limit
ND = Not detected at or above the MDL
P = The RPD between two GC columns exceeds 40%
J = Estimated result < PQL and ≥ MDL
N - Recovery is out of criteria
+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

SHEALY ENVIRONMENTAL SERVICES, INC.

106 Vantage Point Drive
West Columbia, South Carolina 29172
Telephone No. (803) 791-9700 Fax No. (803) 791-9111

SHEALY Chain of Custody Record

Number 101062

Client: ARCADIS	Report to Contact: Chase Forman	Telephone No. / Fax No. / E-mail: 919-854-1282 / cforman@arcadis-us.com	Quote No.
Address: 801 Corporate Center Dr	Sampler's Signature: X	Waybill No.	Page 1 of 1
City: Raleigh / State: NC / Zip Code: 27607	Printed Name: Jason Tillotson	Analysis (Attach list if more space is needed.)	
Project Name: HAAF - PH1R2			
Project No.: GP08HAFS.H13B.KG1R2	P.O. No.		

Sample ID / Description (Containers for each sample may be combined on one line.)	Date	Time	Custody (C=Composite)	Matrix: Aqueous	Matrix: Solid	Matrix: Non-Aqueous	No. of Containers by Preservative Type: Ungres	H2SO4	HNO3	HCl	NaOH	5035 Kit	BTEX Lead (Metal)	Remarks / Cooler I.D.
P1R2-IW-07 (032910)	3-29-10	1504	G	X						3			X	LC30035 Lot No. LC30036
D-MW-05R (032910)		1454												
P1R2-IW-05 (032910)		1539												Labeled IW-05D
P1-104 (032910)		1545												
P1R1-MW-01 (032910)		1653											X	*Bill to Different PO
P1R1-MW-02 (032910)		1627												(see Comments below)
P1R1-IW-02 (032910)		1830												
TB (032910)														

Possible Hazard Identification: X Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison ☐ Unknown

Sample Disposal: ☐ Return to Client X Disposal by Lab

Note: All samples are retained for six weeks from receipt unless other arrangements are made.

Turn Around Time Required (Prior lab approval required for expedited TAT.): X Standard ☐ Rush (Specify)

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished by	3-29-10	1900	1. Received by		
2. Relinquished by			2. Received by		
3. Relinquished by FEDEX	3-30-10	0845	3. Laboratory received by	3-30-10	0845

Comments: *Bill to: GP08HAFS.H13B.KG1R1

LAB USE ONLY: Received on Ice (Circle) Yes No Ice Pack — Receipt Temp. 1.7 °C

DISTRIBUTION: WHITE & YELLOW-Return to laboratory with Sample(s), PINK-Field/Client Copy

Document Number: F-AD-012 Effective Date: 08-04-02

SHEALY ENVIRONMENTAL SERVICES, INC.

Nisreen Saikaly LC30035, LC30036

From: Forman, Chase [Chase.Forman@arcadis-us.com]
Sent: Tuesday, March 30, 2010 1:22 PM
To: Nisreen Saikaly
Subject: RE:

Here you go:

Report these wells under one LOT and analyze for BTEX only (Project number GP08HAFS.H13B.KG1R2):
P1R2-IW-07 (032910)
D-MW-05R (032910)
P1R2-IW-05 (032910)
P1R2-J04 (032910)

Report these wells under a separate LOT and analyze for BTEX and total lead (project number GP08HAFS.H13B.KG1R1):
P1R1-MW-01 (032910)
P1R1-MW-02 (032910)
P1R1-IW-02 (032910)

Please report the trip blank sample on BOTH LOTs.

Got it? Please feel free to call with any questions. Thanks so much!

Chase Forman | Geologist 2 | chase.forman@arcadis-us.com
ARCADIS G&M U.S., Inc. | 801 Corporate Center Drive, Suite 300 | Raleigh, NC 27607
T. 919.854.1282 | M. 740.403.1387 | F. 919.854.5448
www.arcadis-us.com
ARCADIS G&M of North Carolina, Inc.
ARCADIS, Imagine the result
Please consider the environment before printing this email.

From: Nisreen Saikaly [mailto:nsaikaly@shealylab.com]
Sent: Tuesday, March 30, 2010 12:46 PM
To: Forman, Chase
Subject:

Chase,

Please let me know how you would like this lot logged in.

Thanks

Nisreen M. Saikaly

Project Manager
Shealy Environmental Services, Inc.
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Shealy Environmental Services, Inc.
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Sample Receipt Checklist (SRC)

Client: Arcadis Cooler Inspected by/date: WHL 3/30/10 Lot #: LC30035 LC30036

Means of receipt: ☐ SESI ☐ Client ☐ UPS ☑ FedEx ☐ Airborne Exp ☐ Other

Yes ☑	No ☐	NA ☐	1. Were custody seals present on the cooler?
Yes ☑	No ☐	NA ☐	2. If custody seals were present, were they intact and unbroken?

Cooler ID/temperature upon receipt 1 / °C / °C / °C / °C / °C / °C / °C / °C

Method: ☐ Temperature Blank ☑ Against Bottles
Method of coolant: ☑ Wet Ice ☐ Blue Ice ☐ Dry Ice ☐ None

If response is No (or Yes for 14, 15, 16), an explanation/resolution must be provided.

Yes ☐	No ☐	NA ☑	3. If temperature of any cooler exceeded 6.0°C, was Project Manager notified? PM notified by SRC, phone, note (circle one), other: _____ (For coolers received via commercial courier, PMs are to be notified immediately.
Yes ☑	No ☐	NA ☐	4. Is the commercial courier's packing slip attached to this form?
Yes ☐	No ☑	NA ☐	5. Were proper custody procedures (relinquished/received) followed?
Yes ☑	No ☐	NA ☐	6. Were sample IDs listed?
Yes ☑	No ☐	NA ☐	7. Was collection date & time listed?
Yes ☑	No ☐	NA ☐	8. Were tests to be performed listed on the COC or was quote # provided?
Yes ☑	No ☐	NA ☐	9. Did all samples arrive in the proper containers for each test?
Yes ☑	No ☐	NA ☐	10. Did all container label information (ID, date, time) agree with COC?
Yes ☑	No ☐	NA ☐	11. Did all containers arrive in good condition (unbroken, lids on, etc.)?
Yes ☑	No ☐	NA ☐	12. Was adequate sample volume available?
Yes ☑	No ☐	NA ☐	13. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
Yes ☐	No ☑	NA ☐	14. Were any samples containers missing?
Yes ☐	No ☑	NA ☐	15. Were there any excess samples not listed on COC?
Yes ☑	No ☐	NA ☐	16. Were bubbles present >"pea-size" (¼" or 6mm in diameter) in any VOA vials?
Yes ☑	No ☐	NA ☐	17. Were all metals/O&G/HEM/nutrient samples received at a pH of <2?
Yes ☐	No ☐	NA ☑	18. Were all cyanide and/or sulfide samples received at a pH >12?
Yes ☐	No ☐	NA ☑	19. Were all applicable NH3/TKN/cyanide/phenol/BNA/pest/PCB/herb (<0.2mg/L) and toxicity (<0.1mg/L) samples free of residual chlorine?
Yes ☐	No ☐	NA ☑	20. Were collection temperatures documented on the COC for NC samples?

Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)

Sample(s) _____ were received incorrectly preserved and were adjusted accordingly in sample receiving with _____ (H_2SO_4,HNO_3,HCl,NaOH) with the SR # (number)

Sample(s) TB (1) were received with bubbles >6 mm in diameter.

Sample(s) _____ were received with TRC >0.2 mg/L for NH3/TKN/cyanide/BNA/pest/PCB/herb.

Toxicity sample(s) _____ were received with TRC >0.1 mg/L and were analyzed by method 330.5.

FedEx Tracking Number 870985633011

Corrective Action taken, if necessary:
Was client notified: Yes ☐ No ☐
SESI employee: _____
Comments: _____

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