Final
2015 Annual Sampling Report

Groundwater Monitoring and Data Analysis at the Landfill Source Area

Operable Unit 4 FTWW-038
Fort Wainwright, Alaska

ADEC File No. 108.38.070.03
ADEC Hazard ID. 1129

Contract No. W911KB-12-D-0001
Task Order 33

January 2017

FES
FAIRBANKS ENVIRONMENTAL SERVICES INC.

FINAL
2015 ANNUAL SAMPLING REPORT

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Prepared for

U.S. Army Corps of Engineers, Alaska District

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
AEDB-R	Army Environmental Database-Restoration
ADEC	Alaska Department of Environmental Conservation
AWQS	Alaska Water Quality Standards
bgs	below ground surface
°C	degrees Celsius
CAT	Caterpillar
CDQR	Chemical Data Quality Review
cis-1,2-DCE	cis-1,2-Dichloroethene
CRREL	Cold Regions Research and Engineering Laboratory
COC	contaminants of concern
DCE	cis-1,2-dichloroethene
DL	detection limit
DO	dissolved oxygen
DPW	Directorate of Public Works
DQO	data quality objective
EDF	electronic deliverable format
EPA	United States Environmental Protection Agency
°F	degrees Fahrenheit
FES	Fairbanks Environmental Services
FFA	Federal Facility Agreement
FNSB	Fairbanks North Star Borough
FSP	Field Sampling Plan
IBC	Intermediate Bulk Container
IC	Institutional Control
IDW	investigation-derived waste
Landfill	Fort Wainwright Landfill
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LOD	limit of detection
LOQ	limit of quantitation
MCL	maximum contaminant level
mg/L	milligrams per liter
μg/L	micrograms per liter
MOU	Memorandum of Understanding
MS/MSD	matrix spike/ matrix spike duplicate
NFA	No Further Action
OU4	Operable Unit 4
ORP	oxidation/reduction potential
PCA	1,1,2,2-tetrachloroethane
PCE	tetrachloroethene
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance

LIST OF ACRONYMS AND ABBREVIATIONS

QAPP	Quality Assurance Project Plan
QC	quality control
RAG	Remedial Action Goal
RAO	Remedial Action Objective
RI	remedial investigation
ROD	Record of Decision
RPD	relative percent difference
RPM	remedial program manager
SOW	Statement of Work
SSHP	Site Safety and Health Plan
SVOC	semi volatile organic compounds
TAL	TestAmerica Laboratories of Denver, CO
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds

EXECUTIVE SUMMARY

This report documents long-term groundwater monitoring activities at the Fort Wainwright Landfill (Landfill), Fort Wainwright, Alaska. The Landfill is part of Operable Unit 4 (OU4) and the remedial action at this source area consists of capping the approximately 14 acre inactive portion of the Landfill, institutional controls, and natural attenuation of contaminants of concern (COC) in groundwater (U.S. Army, 1996). Groundwater monitoring results are evaluated to determine the effectiveness of the capping and natural attenuation with respect to Remedial Action Goals (RAGs) and to support decisions regarding the effectiveness of the Record of Decision (ROD) remedy. As monitoring data are accumulated, the results are also used to modify the monitoring approach and to better understand interactions between the capped portion of the Landfill and the local groundwater. This Annual Sampling Report provides documentation, evaluation, and a data quality review of data gathered during the spring and fall 2015 sampling events. Fairbanks Environmental Services (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE), Contract Number W911KB-12-D-0001.

Groundwater samples were collected from 13 wells during April 2015 and six wells during November 2015 to evaluate the migration of contaminants from the Landfill. All groundwater samples were submitted for analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), methane, and total metals. Dissolved (field-filtered) iron and sulfate analysis was also conducted.

Downgradient of the Landfill, contaminants of concern (COCs) were detected above RAGs in three out of nine wells; shallow wells AP-5588 and AP-8061, and deep well AP-6532. The following compounds were detected above RAGs in shallow well AP-5588; 1,1,2,2-tetrachloroethane (PCA), cis-1,2-dichloroethene (DCE), 1,1,2-trichloroethane and trichloroethene (TCE). TCE was detected above the RAG in shallow well AP-8061. Benzene was above the RAG in deep downgradient well AP-6532. Arsenic was detected above the RAG in wells downgradient of the Landfill and is believed to be a consequence of natural mineral deposits. Upgradient of the Landfill, benzene and bis(2 ethylhexyl phthalate) were detected above the RAG in shallow well AP-10257 and bis(2 ethylhexyl phthalate) was detected above the RAG in FWLF-4. Nickel was also detected above the RAG in AP-10258.

In general, contaminants appear to migrate along separate flow paths in groundwater downgradient of the Landfill site. Benzene is detected in all wells sampled downgradient of the landfill, typically at concentrations below the RAG; however, it appears that benzene is migrating below permafrost at concentrations exceeding RAGs in a predominately westerly flow path. Benzene is not seen at concentrations exceeding the RAG in deep downgradient wells that are along a southwesterly flow path. It is possible that the permafrost beneath the Landfill is discontinuous and benzene has migrated through permafrost; however, the presence of or depth to permafrost beneath the Landfill is unknown, and it is not known how permafrost affects groundwater flow at depth. Chlorinated solvents are less widespread than benzene in groundwater downgradient of the landfill and appear to be more prevalent on a southwesterly flow path. Specific sources of contamination within the landfill have not been investigated and it is possible that the chlorinated solvents originate from a separate spill than the petroleum contaminants. It appears that chlorinated solvents migrate at the water table downgradient of the landfill until permafrost is encountered, when they continue migrating below permafrost.

Institutional control (IC) site inspections were conducted at the Landfill on multiple days in 2015. The Landfill cap and fence were observed to be in good condition. All groundwater monitoring wells sampled to evaluate natural attenuation of site contaminants were found to be in good condition with locking caps except for AP-6138, a cap and lock were replaced at this well.

Recommendations for 2016 include sampling three wells in the spring only, AP-5588, AP-5589, and FWLF-4, and sampling seven wells in the spring and fall 2016, AP-8061, AP-10257, AP-10258, AP-8063, AP-6532, AP-6532, and AP-6535. Methane analysis should be removed from the sampling program and an institutional controls (IC) inspection of the Landfill cap and monitoring wells should be conducted.

1.0 INTRODUCTION

This report documents long-term groundwater monitoring activities conducted during 2015 at the Fort Wainwright Landfill (Landfill), Fort Wainwright, Alaska. It also describes the 2015 institutional controls inspection. The Landfill is part of Operable Unit 4 (OU4) and the remedial action at this source area consists of capping the approximately 14 acre inactive portion of the Landfill, institutional controls (ICs) and natural attenuation of contaminants of concern (COC) in groundwater (USARAK, 1996). Groundwater monitoring results are evaluated to determine the effectiveness of the capping and natural attenuation with respect to Remedial Action Goals (RAG). As monitoring data are accumulated, the results are also used to modify the monitoring approach and to better understand interactions between the capped portion of the Landfill and the local groundwater. Fairbanks Environmental Services (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE), Contract Number W911KB-12-D-0001 Task Order 33. The work was completed according to the 2014 Operable Unit Work Plan (FES, 2014a). The work was completed under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and in compliance with the OU4 Record of Decision (ROD), Federal Facility Agreement (FFA), and state of Alaska regulations.

1.1 Monitoring Report Organization

The 2015 field efforts included groundwater sampling of Landfill wells and completion of the annual IC inspection. This Annual Sampling Report provides documentation, evaluation, and a data quality review of data gathered during the spring and fall sampling events. A description of the procedures and results associated with these activities are presented in the following sections:

- Section 2 – Groundwater monitoring and sampling activities
- Section 3 – Groundwater sample results and discussion
- Section 4 – Institutional Control inspection
- Section 5 – Conclusions and recommendations
- Section 6 – References

Supporting information can be found in the appendices listed below. Additional information not provided in hard copy, such as laboratory reports and photographs, are provided in the Supplemental Data folder on the compact disc accompanying this report.

- Appendix A – Groundwater Sampling Forms and Field Notes
- Appendix B – Chemical Data Quality Review & ADEC Laboratory Data Review Checklists
- Appendix C – Groundwater Sample Tracking and Analytical Result Tables
- Appendix D – Photo Log
- Appendix E – FFA Meeting Key Decisions

1.2 Background

Fort Wainwright is an active U.S. Army facility, located on the eastern edge of Fairbanks, Alaska. OU4 consists of three source areas: the Coal Storage Yard (CSY), the Fire Training Pits (FTP), and the Landfill (consisting of an active and inactive portion). This report focuses on the current phase of a long-term monitoring program at the Landfill portion of OU4. This monitoring has been established as a key element of the remedial approach for the inactive portion of the Landfill. The following sections provide background information for each of the source areas at OU4.

1.2.1 Coal Storage Yard

The OU4 CSY is situated south of a coal fired cogeneration power plant that was used as the sole source of heat and electricity for FWA. The area of concern was approximately 800 ft by 300 ft and situated between a cooling pond and embankment. Coal was stored directly on the ground since the 1950s. The pile was sprayed with waste petroleum products and waste solvents from the 1960s to 1993 to increase the thermal content of the coal. The site is still used for coal storage. Three USTs were located in the area. Two were used for the storage of waste fuel products. They were installed in the 1980s and removed in July, 1995. The third UST was used to store diesel fuel for power plant equipment.

The primary sources of contamination at the CSY were associated with waste fuel products that were sprayed on the coal pile, the storage of these waste fuel products, leaks from the USTs, and the coal pile. Groundwater was contaminated by petroleum hydrocarbons, chlorinated solvents, and bis(2-ethylhexyl)phthalate.

The remedy consisted of operating an AS/SVE system, groundwater monitoring, and ICs. The AS/SVE system was installed in 1997 and operated until 2000. Groundwater monitoring has been discontinued. ICs have been implemented, they include restrictions on site access, construction, and well installation as long as hazardous substances remain at the site at levels that preclude unrestricted use. The Coal Storage Yard was recommended for No Further Action (NFA) in the Second Five Year Review; however, it is still listed as an active site. The CSY is not discussed further in this Report.

1.2.2 Fire Training Pits

FTP areas were used to conduct fire training exercises. They are located within the main cantonment area, south of Montgomery Road near the southeast corner of Ladd Army Airfield on U.S. Army Garrison Fort Wainwright. There were two separate FTP areas: FTP-3A and FTP-3B. Located between the two areas is the Military Operations in Urban Terrain (MOUT) training area.

The former FTP areas consist of two separated areas that are located on opposite sides of the current Military Operations in Urban Terrain (MOUT) training area. Fire Training Pit 3A (FTP-3A) is located west of the MOUT and was used for fire training sometime after 1978 until 1988. The former Fire Training Pit 3B (FTP-3B) is located east of the MOUT and was used prior to the FTP-3A area (1967 through 1978).

Several investigations and removal actions occurred at FTP sites during the 1990s and a Remedial Investigation / Feasibility Study (RI/FS) was performed in 1993/1994. The RI/FS determined that since the contaminants exceeding regulatory levels within the FTP areas consisted of only petroleum hydrocarbons, the soil contamination would be addressed through a removal action. A Decision Document for soil removal at the Fire Training Pits area was included in appendix to the OU-4 ROD.

The 1996 excavation at the Fire Training Pits was documented in the report, "Site Assessment Report – Remove Soil at Burn Pits, Fort Wainwright – January 1997". The report describes excavation, stockpiling, transportation, treatment, and disposal of contaminated soil. The target of the excavation was petroleum contaminated soils, and the soils were transported to and treated by OIT in Moose Creek, AK. The treated soil was transported back to Fort Wainwright where it was used at the active landfill as capping material.

While the RI and the subsequent removal action successfully addressed Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements for the FTP sites, concern remained that soil contamination could be encountered during planned construction projects at these sites. In addition, there was concern regarding the potential for the construction projects to encounter contaminants that were not analyzed for during previous investigations. Perfluorinated compounds (PFCs), a component of firefighting foams used in the 1960's and 1970's, may be present in soils and groundwater at former fire training areas. Two particular PFCs, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) have been identified by the U.S. Environmental Protection Agency (EPA) as "emerging contaminants".

Geophysical surveys and soil and groundwater investigations were conducted in 2013. The geophysical survey did not identify any large buried features. Soil sample exceedances of ADEC cleanup levels were limited to arsenic, chromium, and selenium, which may be naturally occurring at the site. Soil samples were also analyzed for PFCs. Although there were widespread PFOS detections at the FTP-3A and FTP-3B sites, only one surface soil sample (collected from FTP-3A) exceeded both the EPA and ADEC soil screening/proposed cleanup levels. Results of ongoing investigations at the Former Fire Training Pits are discussed further in a separate Report (FES 2016) and are not addressed further in this Report.

1.2.3 Fort Wainwright Landfill

The Landfill source area covers approximately 14 acres adjacent to River Road in the north central portion of Fort Wainwright (Figure 1-1). The southwestern portion of the Landfill is capped and most of the current groundwater monitoring well network is located downgradient of the capped area.

The area now covered by the Landfill was initially used as a gravel pit. Gravel excavation began at this location in 1944, and landfill operations reportedly began in the 1950s. Unsegregated waste was disposed in the gravel pits and then burned. When the gravel pits were filled with debris, they were covered. Landfill management practices have changed significantly over the years and, at present, the active portion of the Landfill is accepting only asbestos and coal ash. The active portion of the Landfill is currently permitted through 2020.

A Remedial Investigation (RI) was completed at the site in 1994. COCs identified in groundwater include benzene, several chlorinated compounds, and trace metals. Subsequent investigations have been completed, including the installation of additional monitoring wells and the delineation of permafrost regions. Groundwater flow in the vicinity of the Landfill is complicated by the presence of discontinuous permafrost. Several of the groundwater monitoring wells have been completed in underlying areas of permafrost and thawing the wells is necessary prior to sampling.

The OU4 ROD, signed in September 1996 (USARAK, 1996), specified the following phased approach to remediation of the Landfill source area:

- Capping the inactive portion of the Landfill – completed in September 1997 – along with natural attenuation, monitoring of groundwater, and institutional controls; and
- Evaluation of potential groundwater treatment, if levels of contamination in groundwater were found to increase (which has not been shown to date).

Landfill CAT Shed – Building 1191

The Landfill Caterpillar (CAT) Shed (Building 1191) is located south of the active Fort Wainwright Landfill, off River Road. A plan drawing dated August 1972, indicates that the building was previously used for vehicle storage and repair. The CAT Shed is equipped with a vehicle bay that was historically used for minor maintenance of landfill equipment (CAT D7 and front-end loader); however, the building lacks the proper lift equipment necessary to facilitate most maintenance, so the majority of maintenance occurs off site.

This building had a septic system and leach field that was investigated in 2010 (FES, 2011). Historically, wastewater from the CAT shed consisted of sanitary waste from the bathroom facilities and effluent from a floor drain in the vehicle bay. The sanitary waste-stream discharged to a 500 gallon septic tank on the west side of the building. From there, a sewer line extended 100 feet to a timber stave leaching pit. Bentonite was pumped into the septic tank and leach pit on July 29, 2011 to permanently close the system.

An investigation was conducted at the Building 1191 Landfill CAT Shed on October 4, 2012 in order to assess groundwater contamination found while conducting a preliminary investigation in 2010 (FES, 2011). Three monitoring wells were installed: AP-10258 at the location where the highest benzene concentration was detected during the 2010 investigation, AP-10257 crossgradient of the site, and AP-10259 downgradient of the site.

During the 2012 investigation, benzene was detected above the remedial action goal (RAG) of 5 micrograms per liter (µg/L) in AP-10257 (crossgradient of the leach field) at a concentration of 14 µg/L. It is most likely that the benzene detected in this well is associated with the Landfill debris and not migration from the Building 1191 septic system. Benzene was not detected in AP-10258 or AP-10259. Following the 2012 investigation, these wells were moved to the OU4 Landfill sampling program and they continue to be sampled as part of the OU4 sampling effort.

1.2.4 Memorandum of Understanding

In 1997, a Memorandum of Understanding (MOU) was signed stating that groundwater monitoring would meet the requirements of 40 CFR 258 (VOCs and Metals), as well as the remedial goals established in the ROD (requiring the additional analysis of SVOCs) (ADEC, 1997). The MOU recommended sampling at the following well locations: AP-5588, AP-5589, AP-6136, AP-6137 (replaced by AP-8061), AP-6138, AP-6139 (replaced by AP-8062 and again by AP-9076), AP-6140, FWLF-4, AP-6532 (formerly identified as DH-6534) and AP-6130.

The MOU also states, however, that "If for some reason a well designated for sampling becomes damaged or frozen such that it cannot be used for collecting samples, a comparable well will be selected. If a comparable well does not exist, a new one will be drilled to meet these monitoring requirements".

Groundwater monitoring has been performed at the Landfill since 1997 and some changes to the wells identified in the MOU have been made over the years; however, these changes have not deviated from the MOU objectives and have been approved by remedial program managers (RPMs) through acceptance of recommendations made in annual groundwater sampling reports. Six of the original 10 wells identified in the MOU continue to be sampled as part of the Landfill groundwater monitoring program, which include: AP-5588, AP-5589, AP-6136, AP-6138, FWLF-4, and AP-6532 (formerly identified as DH-6534). Two additional wells, AP-8061 and AP-8063, are also sampled as part of the monitoring program. Downgradient deep monitoring wells AP-6530 and AP-6535 and upgradient shallow wells AP-10257, AP-10258, and AP-10259 (associated with the Building 1191 leach field) were also recently added to the monitoring program. In 2015, wells AP-6136, AP-6138, and AP-10259 were removed from the monitoring program due to the lack of contamination detected at these wells over time. A brief description of changes that have been made to the sampling program since 1997 is provided below and outlined on Table 1-1.

Dry Wells AP-6130 and AP-6140

Well AP-6130 was installed upgradient of the Landfill in the vicinity of the Birch Hill Ski Area. Well AP-6140 was also installed upgradient, but in closer proximity to the Landfill. The 1994 RI documents that permafrost was encountered while drilling AP-6130 and AP-6140 and states that "Both wells failed to produce adequate quantities of water; therefore, no samples were collected." Additionally, no records of any groundwater sampling at these locations could be found, so it is not known why the 1997 MOU lists these wells as recommended sampling locations. Based on historical records, nearby well AP-7505 was sampled in place of AP-6140 until spring 1999, when it was replaced with AP-6132. The August 1999 Groundwater Sampling Reports (DOWL, 2002) states "Due to the integrity of well AP-7505 being questionable, the State of Alaska and the Army agreed to have well AP-6132 sampled as a background well beginning in August 1999."

Replaced Wells AP-6137 and AP-6139

Wells AP-6137 and AP-6139 are located downgradient, southwest, of the Landfill. These wells were replaced due to damage from frost jacking. The 2002 Monitoring Well Replacement Report (ENSR, 2002) documents the installation of replacement wells AP-6137A (also named AP-8061) and AP-6139A (also named AP-8062/AP-9076). Well AP-8061 continues to be sampled as part of the groundwater monitoring program for the Landfill. In 2004, AP-9076 was installed to replace damaged well AP-6139A (AP-8062). Well AP-9076 was sampled as part of the monitoring program until fall 2008 when it was removed from the sampling program due to historical groundwater elevation anomalies. Groundwater at this sampling location did not appear to be connected to the groundwater flow pathway, potentially due to discontinuous permafrost in the area. The recommendation for removal of well AP-9076 (formerly AP-6139, AP-6139A/AP-8062) from the sampling program was made in the Final 2008 Annual Sampling Report and approved by the RPMs.

Well AP-8063

An additional well, AP-6139B (also named AP-8063), was installed in 2002 to delineate downgradient migration of contaminants below permafrost. The original AP-8063 was replaced in 2003 with an adjacent well (also called AP-8063) that was pressurized. The presence of permafrost in the area around the Landfill causes groundwater in the deep wells to freeze between sampling events. There was an attempt by previous contractors to seal the well casing to maintain an internal pressure of 50 pounds per square inch (psi) between sampling events in order to depress the water level and prevent freezing. However, pressurizing the well was not successful. Well AP-8063 continues to be sampled as part of the groundwater monitoring program for the Landfill; although, it is no longer pressurized and is thawed using dedicated heat trace. Additional details for thawing are presented in Section 2.3.

Wells DH-6534 and AP-6532

Since sampling of the Landfill monitoring network began, there has been some confusion concerning the well identified as DH-6534. This well has been identified as DH-6534 since before 2004 and the well that is sampled is labeled DH-6534. However, the total depth of the well sampled has not matched the total depth identified on the boring log for DH-6534. During the 2010 groundwater elevation survey and permafrost evaluations, additional research was conducted that included identifying wells associated with historical geophysical studies. This research verified the well identified as DH-6534 is actually AP-6532. A boring log for AP-6532 also matches the depth of the well. This research also verified that the well identified as Unknown F is actually DH-6534 (also referred to as AP-6534). These wells were correctly labeled in the field.

Well AP-6132

Well AP-6132 had been sampled as an upgradient well within the Landfill monitoring network. However, a permafrost evaluation conducted in 2010 identified a massive block of permafrost between this well and the Landfill (shown on Figure 3-1). The permafrost body effectively interrupts groundwater flow in the vicinity of AP-6132 and the Landfill source area. Since this well is not connected to groundwater flow to the Landfill source area, it was removed from the Landfill monitoring network.

Wells AP-6530 and AP-6535

These two wells are the farthest downgradient deep wells in the monitoring network. They were added to the monitoring network in 2012 in order to monitor the downgradient migration of benzene in the subpermafrost aquifer.

Wells AP-6136, AP-6138, and AP-10259

Well AP-6136 and AP-6138 have been sampled as part of the Landfill monitoring network since 1997. The only COC that has ever been detected above the RAG in these wells is bis(2-ethyllllhexyl)phthalate, and the last time it was detected above the RAG was in 2005 and 2006, respectively. AP-10259 was installed in 2012 as part of the leach field investigation and no COCs have exceeded RAGs in this well since it was first sampled. Due to the absence of COCs, these three wells were removed from the monitoring network following the spring 2015 sampling event.

Table 1-1 – Changes to the Landfill Monitoring Well Network

Wells recommended in the MOU	Wells sampled in place of MOU wells	Comments
AP-5588	--	Continues to be sampled in the monitoring network
AP-5589	--	Continues to be sampled in the monitoring network
AP-6136	--	Removed from the monitoring network due to absence of COC above RAGs since 2005.
AP-6137	AP-8061	AP-8061 replaced damaged well AP-6137. AP-8061 continues to be sampled in the monitoring network
FWLF-4	--	Continues to be sampled in the monitoring network
AP-6138	--	Removed from the monitoring network due to absence of COC above RAGs since 2006.
AP-6139	AP-8062, AP-9076	AP-8062 replaced damaged well AP-6139. AP-8062 was also damaged and was replaced by AP-9076. This well was removed from the monitoring network.
AP-6140	AP-7505, AP-6132	AP-6140 was a dry well and thus never sampled. Nearby well AP-7505 was sampled in place of dry well AP-6140. In 1999 well, AP-6132 replaced AP-7505 as an upgradient well as agreed upon by the RPMs. However, AP-6132 was removed from the monitoring network in 2011 as explained above.
DH-6534	AP-6532	Well DH-6534 was incorrectly labeled and sampled in the monitoring network and is actually AP-6532. Well location remains the same and well will now be referenced as AP-6532.
AP-6130	--	AP-6130 was a dry well and was never sampled as part of the monitoring network.
--	AP-8063	AP-8063 was added to the monitoring network in order to further delineate contaminant migration in the subpermafrost aquifer.
--	AP-6530 and AP-6535	Added to the monitoring network to monitor downgradient migration of benzene in the subpermafrost aquifer.
	AP-10257, AP-10258	Added to the monitoring network to monitor upgradient benzene concentrations associated with the Building 1191 leach field.

1.3 Remedial Action Objectives

The OU4 ROD (USARAK, 1996) established the following Remedial Action Objectives (RAOs) for groundwater COCs at the Landfill:

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame
- Reduce further migration of contaminated groundwater from source areas
- Prevent use of groundwater containing contaminants at levels above federal maximum contaminant levels (MCLs) and Alaska Water Quality Standards (AWQS)
- Use natural attenuation to attain AWQS

1.4 Remedial Goals

Federal and State of Alaska drinking water MCLs were adopted as groundwater remedial goals for benzene, cis-1,2-dichloroethene (DCE), 1,1,2-trichloroethane, vinyl chloride, trichloroethene (TCE), and bis(2-ethylhexyl)phthalate. Since there are no federal or state MCLs for 1,1,2,2-tetrachloroethane (PCA), the RAG for this contaminant was based on 1 x 10^{-4} risk-based concentrations for human health risk estimates. The RAGs for the COCs that were identified in the ROD are shown below on Table 1-2.

Table 1-2 – Groundwater Contaminants of Concern

Contaminants of Concern	**Remedial Goal (μg/L)**
Benzene	5
cis-1,2 Dichloroethene (cis-1,2-DCE)	70
1,1,2,2-Tetrachloroethane (PCA)	5.2
1,1,2-Trichloroethane	5
Vinyl Chloride	2
Trichloroethene (TCE)	5
bis(2-Ethylhexyl)phthalate	6

μg/L – micrograms per liter

1.5 OU4 Source Area Tracking

The OU4 source areas are tracked in the ADEC Contaminated Sites database, which is maintained by the ADEC project manager assigned to the site, and by the Army in the Army Environmental Database-Restoration (AEDB-R) for funding purposes. The source area description, along with the AEDB-R and ADEC IDs are summarized in Table 1-3.

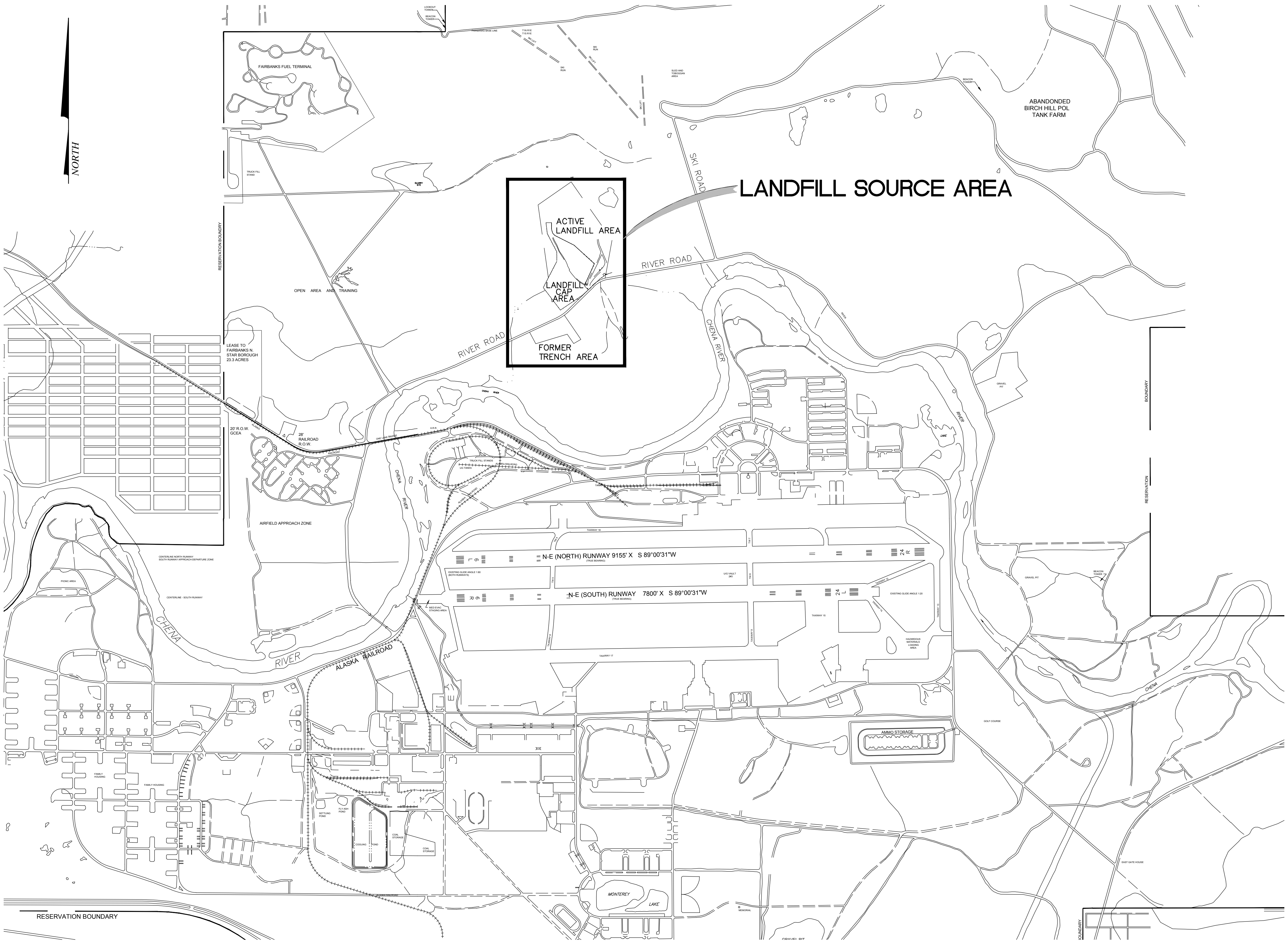
Table 1-3. Crosswalk Table for OU4 Source Area Tracking Numbers[1]

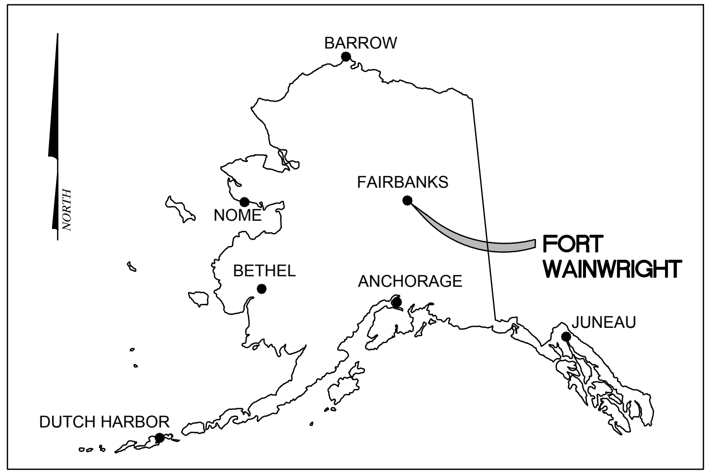
OU4 Source Area	**AEDB-R Number**	**ADEC File ID**	**ADEC Hazard ID**	**Site Status[2]**
Landfill Plume	FTWW-038	108.38.070.03	1129	Active
Fire Training Area	FTWW-037	108.38.070.02	1419	Active
Coal Storage Yard	FTWW-011	108.38.070	2342	Active
Landfill Garage Building 1191[3]		108.38.070.04	25741	Active

[1] Based on information from the ADEC Contaminated Sites Database available at http://dec.alaska.gov/spar/csp/db_search.htm and the Army AEDB-R

[2] Site status from the ADEC Contaminated Sites Database

[3] Wells installed to investigate the Building 1191 leach field are currently sampled as part of the Landfill Plume site.





LOCATION MAP

FAIRBANKS ENVIRONMENTAL SERVICES 3538 INTERNATIONAL STREET FAIRBANKS, ALASKA	ALASKA DISTRICT CORPS OF ENGINEERS ANCHORAGE, ALASKA

Site Vicinity and Location Map
Landfill Source Area

2015 Annual Sampling Report
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Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001	FIGURE: 1-1	DATE: 1/17

2.0 GROUNDWATER MONITORING, SAMPLING, AND ANALYTICAL PROGRAM

Field activities were completed at OU4 in 2015 according to the procedures outlined in the 2014 Work Plan (FES, 2014a). Groundwater sampling was conducted in April and November 2015. The following section discusses monitoring and sampling activities. Monitoring and sampling results are discussed in Section 3.0.

2.1 Pre-sampling Activities

Each well was inspected prior to measuring water levels and collecting groundwater samples. Well inspection consisted primarily of visual observation of the wellhead to identify any damage to the security casing or the monitoring well itself. The top of the polyvinyl chloride (PVC) riser at well AP-5588 was noted as broken during the April event. The dedicated heat trace at AP-6532 failed and steam was used to thaw the well for the spring event. New dedicated heat trace was installed after the April sampling event.

Following visual inspection, the monitoring well cap was removed and the depth to the static water level was measured to the nearest 0.01 foot, relative to the top of the monitoring well casing. The total depth of the well and the depth to ice in frozen wells were also measured. Water level measurements were recorded on groundwater sampling forms (provided in Appendix A).

2.2 Groundwater Sampling and Analysis

A total of thirteen monitoring wells were sampled at the Landfill during April 2015. Six monitoring wells were sampled at the Landfill during November 2015. General locations and depths of the sampled wells are listed in Table 2-1. Well locations are also shown on Figure 2-1.

Table 2-1 Monitoring Wells Sampled in at the Landfill in Spring and Fall 2015

Well	Depth	Location
AP-5588[1]	Shallow	downgradient (west) of capped Landfill
AP-8061		
AP-5589[1]	Intermediate	
AP-6136[1]		
AP-6138[1]		
AP-6530	Deep	
AP-6535		
AP-8063[1]		
AP-6532		
FWLF-4[1]	Shallow	upgradient (east) of capped Landfill
AP-10257	Shallow	crossgradient of the Building 1191 leach field area
AP-10258	Shallow	within the Building 1191 leach field area
AP-10259[1]	Shallow	downgradient of the Building 1191 leach field area

[1] denotes wells sampled during the spring event only

Techniques used to purge and sample the groundwater were consistent with low-flow sampling methodology (Puls and Barcelona, 1996) and are detailed in the Operable Unit Sites Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP, FES, 2014b). The low-flow sampling method utilized a variable speed peristaltic pump equipped with dedicated Teflon-lined tubing to purge and sample the wells. The tubing was placed approximately 2 feet below the water table for wells screened across the water table. For wells screened below the water table, the tubing was placed in the middle of the wetted screen.

Groundwater was purged at a rate between 0.03 and 0.15 gallons per minute. Water quality measurements were recorded every five minutes and monitoring wells were purged until water quality parameters stabilized, per ADEC guidance (ADEC, 2010). Field parameters were measured using YSI water quality meters installed in a flow through cell. The instruments were calibrated at the beginning of each day according to the manufacturer's instructions. Measured parameters included pH, temperature, specific conductivity, dissolved oxygen (DO) concentration, and oxidation/reduction potential (ORP). Turbidity was also measured using an Oakton T-100 turbidity meter. When the parameters stabilized the flow-through cell was disconnected and samples were collected with the pump set at a low-flow rate. Instrument calibration and groundwater sampling forms are presented in Appendix A. Table 2-2 presents the field measurements recorded during the time of sampling from 2013 through 2015.

Groundwater samples collected from each of the monitoring wells were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total metals, dissolved (field-filtered) iron, and sulfate. TestAmerica Laboratories, Inc (TAL) of Seattle, Washington performed project and quality control laboratory analyses. Methane was subcontracted to TAL of Denver, Colorado for analysis. A performance evaluation (PE) sample was also submitted blindly with the project samples to the laboratory located in Seattle. An evaluation of data quality is detailed in a Chemical Data Qualify Review (CDQR) and ADEC Laboratory Data Review Checklists. The CDQR, ADEC Checklists, and the PE sample Certificates of Analysis are provided in Appendix B. The Sample Tracking and Analytical Results tables are presented in Appendix C. The analytical methods used to analyze groundwater samples collected at the Landfill are based on requirements defined in the solid waste permit issued for this facility by the ADEC and are listed below.

- EPA Method 8260C (VOCs)
- EPA Method 8270D (SVOCs)
- EPA Method 6020A (Total Metals)
- Method RSK-175 (Methane)
- EPA Method 6010C (Iron)
- EPA Method 300.0 (Sulfate)

2.3 Thawing of Frozen Wells

The presence of permafrost in the area around the Landfill causes groundwater in the deep wells to freeze between sampling events. Monitoring wells AP-6530, AP-6535, AP-6532, and AP-8063 are deep wells screened below permafrost, which require thawing prior to sample collection. In order to minimize dilution of groundwater and volatization of contaminants, heat trace cable has been placed in these wells to thaw the column of water frozen by permafrost. Dedicated heat trace has been placed from the top of the casing to approximately five feet above the bottom of the wells. Prior to conducting each sampling event, the heat trace was connected to a generator that warmed the heat trace cable to approximately 50 degrees Fahrenheit (° F). The thawing process typically takes two to three days, depending on well depth.

During the spring 2015 sampling event, the dedicated heat trace at AP-6532 failed and steam was used to thaw the well for the spring event. A portable generator, steam pressure washer, and a water tank filled with potable water were used for thawing. A rigid hose attachment was placed down the well casing and hot water was introduced into the well until the hose broke through the ice.

2.4 Decontamination

Reusable sampling equipment consisted of a water level, which was decontaminated between every well. The decontamination procedure consisted of an Alconox detergent wash followed by a potable water rinse. Dedicated Teflon-lined tubing prevented cross-contamination when using the peristaltic pump.

2.5 Investigation Derived Waste Disposal

Investigation-derived waste (IDW) generated during OU4 field activities in 2015 included purge water and general refuse (disposable tubing, nitrile gloves, etc.) from monitoring well sampling activities. All IDW was managed according to the procedures outlined in the Work Plan (FES, 2014a), with the exception of the disposal of IDW water.

Purge water was containerized at the time of sampling in 15-gallon poly drums. The drums were labeled with a unique ID and a form was completed documenting the ID and purge volume from each well. The drums were taken to the Fort Wainwright Defense Environmental Restoration Account (DERA) building for temporary storage. The water was characterized using the laboratory results from the individual wells. These results and the IDW storage forms were provided to Environmental Compliance Consultants (ECC), and the purge water was disposed of under the Postwide waste contract in accordance with applicable laws. The non-hazardous solid wastes, including disposable tubing, nitrile gloves, paper towels, etc. were disposed of at the Fairbanks North Star Landfill. Complete documentation of IDW disposal, including purge water from OU4, will be included in a forthcoming 2015 IDW Management Summary (anticipated 2016).

TABLE 2-2 OU4 LANDFILL FIELD MEASUREMENTS

Well ID	Sample ID	Sample Date	Sample Time	Field Measurements								
				Water Depth[1] (feet btoc)	Drawdown[2] (feet)	Temp (°C)	Conductivity (mS/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Well Stabilized[3] (Y/N)
OU4 Landfill												
FWLF-4	13FW414WG	6/18/2013	1100	16.16	0	3.91	0.682	0.23	5.92	-31.0	5.87	Y
	13FW4230WG	9/10/2013	1620	17.83	0	5.55	0.669	0.25	5.60	-37.5	2.08	Y
	14FWOU416WG	10/21/2014	1630	16.16	0	1.66	0.736	0.34	6.49	31.0	2.75	Y
	15FWOU401WG	4/7/2015	855	17.93	0	1.51	0.772	0.85	6.50	42.1	3.92	Y
AP-6136	13FW404WG	6/17/2013	1450	17.91	0	7.31	0.265	2.28	6.72	-38.6	3.12	Y
	13FW428WG	9/10/2013	1235	19.91	0	3.34	0.276	0.27	6.07	-21.5	3.51	Y
	14FWOU410WG	10/21/2014	1045	18.25	0	1.25	0.289	0.96	5.70	38.2	1.02	Y
	15FWOU410WG	4/8/2015	1350	19.74	0	2.68	0.304	2.69	6.14	4.8	5.04	Y
AP-5588	13FW410WG	6/17/2013	1415	15.21	0	4.60	1.145	6.55	5.97	-8.9	27.8	Y
	13FW425WG	9/10/2013	1605	16.93	0	3.74	1.142	0.32	5.74	-60.8	4.34	Y
	14FWOU402WG	10/20/2014	1200	15.38	0	1.39	0.989	0.93	6.03	50.6	50.32	Y
	15FWOU407WG	4/7/2015	1520	17.00	0	1.51	1.239	0.61	6.64	-49.6	16.11	Y
AP-5589	13FW409WG	6/17/2013	1145	16.20	0	3.52	0.917	0.20	5.80	-62.6	1.75	Y
	13FW427WG	9/10/2013	1740	17.90	0	4.08	0.992	0.28	5.71	-72.1	3.54	Y
	14FWOU406WG	10/20/2014	1430	16.35	0	1.59	0.941	0.72	6.18	15.3	1.14	Y
	15FWOU409WG	4/7/2015	1645	17.98	0	2.24	0.999	0.45	6.71	-72.3	5.01	Y
AP-8061 (AP-6137A)	13FW413WG	6/17/2013	1645	8.35	0	2.53	0.559	0.50	6.61	-16.2	10.49	Y
	13FW423WG	9/10/2013	1450	10.00	0	2.45	0.700	0.22	5.69	-71.5	38.4	Y
	14FWOU401WG	10/20/2014	1125	8.60	0	2.08	0.646	0.41	5.8	-33.3	20.14	Y
	15FWOU405WG	4/7/2015	1210	10.07	0	1.38	0.717	0.48	6.79	-58.2	9.12	Y
	15FWOU418WG	11/6/2015	1030	7.71	0	1.42	0.700	0.25	4.13	28.7	2.07	Y
AP-6138	13FW412WG	6/17/2013	1730	8.98	0	2.90	0.389	0.13	5.82	-44.4	1.9	Y
	13FW424WG	9/10/2013	1315	10.59	0	2.46	0.393	0.21	5.32	-14.3	2.06	Y
	14FWOU403WG	10/20/2014	1300	9.23	0	2.03	0.394	0.22	6.4	-64.3	7.77	Y
	15FWOU403WG	4/7/2015	1055	10.67	0	1.28	0.461	0.71	6.62	12.1	3.69	Y
AP-6530	13FW415WG	6/18/2013	1150	15.22	0	2.32	0.549	0.22	6.51	7.8	1.55	Y
	13FW431WG	9/16/2013	1200	15.82	0	0.81	0.573	0.25	6.04	-66.9	4.16	Y
	14FWOU405WG	10/20/2014	1420	15.25	0	0.70	0.502	0.53	6.31	-62.5	0.55	Y
	15FWOU406WG	4/7/2015	1510	16.70	0	1.07	0.494	1.12	6.34	-3.3	1.98	Y
	15FWOU422WG	11/6/2015	1630	14.02	0	3.30	0.479	1.29	5.64	-83.8	2.67	Y
AP-6532	13FW417WG	6/18/2013	1320	16.15	0	2.56	0.407	0.51	6.37	-1.9	3.92	Y
	13FW435WG	9/16/2013	1030	16.70	0	0.47	0.404	0.36	6.01	-51.2	3.14	Y
	14FWOU414WG	10/22/2014	920	16.14	0	0.00	0.372	1.19	6.41	4.6	4.99	Y
	15FWOU402WG	4/7/2015	1045	17.46	0	1.16	0.379	1.22	6.03	24.5	9.66	Y
	15FWOU424WG	11/9/2015	1350	14.92	0	1.00	0.399	0.45	5.47	-13.9	6.49	Y
AP-6535	13FW408WG	6/17/2013	1400	13.39	0	2.00	0.455	0.20	6.56	-4.9	3.5	Y
	13FW431WG	9/16/2013	1435	13.99	0	1.80	0.502	0.31	6.36	-70.8	14.89	Y
	14FWOU412WG	10/21/2014	1230	13.70	0	1.94	0.455	0.92	5.93	19.9	3.06	Y
	15FWOU404WG	4/7/2015	1300	14.95	0	2.20	0.438	2.38	6.17	6.9	11.94	Y
	15FWOU425WG	11/9/2015	1510	12.35	0	1.08	0.467	0.34	5.88	-40.2	33.98	Y
AP-8063	13FW406WG	6/17/2013	1140	15.61	0	2.71	0.897	0.45	6.43	10.1	3.01	Y
	13FW433WG	9/16/2013	1700	16.56	0	2.13	0.890	0.35	6.13	-69.4	30.7	Y
	14FWOU407WG	10/20/2014	1535	15.87	0	0.37	0.958	0.57	6.36	-58.6	7.08	Y
	15FWOU411WG	4/8/2015	1015	17.33	0	0.80	0.171	1.37	6.22	35.4	49.62	Y
AP-10257MW	13FW405WG	6/17/2013	1645	17.79	0	8.86	0.522	3.21	6.33	30.9	7.72	Y
	13FW429WG	9/10/2013	1445	19.61	0	4.19	0.589	0.39	6.04	58.2	2.2	Y
	14FWOU413WG	10/21/2014	1400	17.70	0	1.88	0.716	0.27	6.14	203.9	6.6	Y
	15FWOU413WG	4/8/2015	1120	19.65	0	1.60	0.532	0.92	6.21	135.2	16.5	Y
	15FWOU420WG	11/6/2015	1330	17.25	0	2.52	1.175	0.19	5.17	124.9	6.48	Y
AP-10258MW	13FW401WG	6/17/2013	1105	17.32	0	6.41	0.469	4.47	6.06	82.7	7.43	Y
	13FW421WG	9/9/2013	1325	19.12	0	2.98	0.488	0.48	6.1	150.2	4.16	Y
	14FWOU409WG	10/21/2014	1050	17.25	0	2.43	0.676	1.43	5.71	232.3	1.16	Y
	15FWOU408WG	4/8/2015	1325	19.15	0	1.55	0.590	0.75	6.18	129	2.96	Y
	15FWOU419WG	11/6/2015	1150	16.77	0	3.07	0.554	0.31	5.42	168.6	3.15	Y
AP-10259MW	13FW403WG	6/17/2013	1335	17.64	0	6.98	0.809	5.14	6.54	40	4.31	Y
	13FW420WG	9/9/2013	1150	19.51	0	3.44	0.789	1.55	6.45	168.8	11.77	Y
	14FWOU411WG	10/21/2014	1300	17.38	0	8.76	0.827	3.78	6.32	209.9	0.2	Y
	15FWOU415WG	4/8/2015	1440	19.60	0	2.05	0.910	2.79	6.66	92.7	2.9	Y

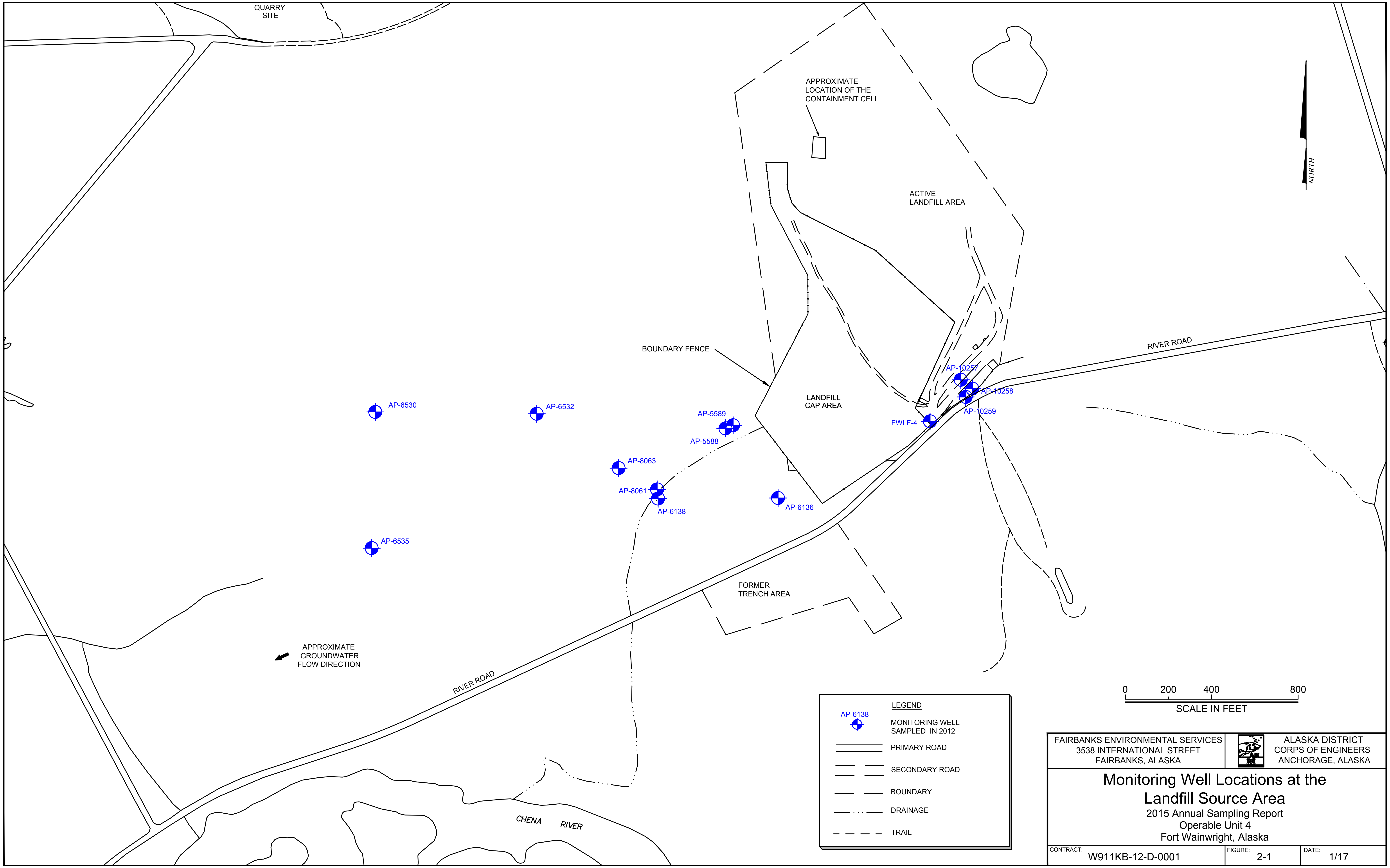
Notes:

[1] Water depth shown was measured on the date shown prior to removing purge water

[2] Drawdown measured during the last three readings.

[3] Well stabilization as defined by ADEC Draft Field Sampling Guidance (May 2010). Individual parameter stabilization discrepancies and potential impact to data quality is discussed in the CDQR.

btoc - below top of casing	mS/cm - millisiemens per centimeter
°C - degree Celsius	mV - millivolts
DO - dissolved oxygen	NTU - nephelomatic turbidity units
mg/L - milligrams per liter	ORP - oxidation reduction potential



FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Monitoring Well Locations at the Landfill Source Area

2015 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001
FIGURE: 2-1
DATE: 1/17

3.0 GROUNDWATER MONITORING RESULTS

The following sections provide a discussion of the results of the well inspections, groundwater elevations, and groundwater analytical results.

3.1 Groundwater Elevations

All groundwater levels were within the screened intervals of the shallow-screened monitoring wells during sample collection. However, the groundwater levels were above the screened intervals in the intermediate- and deep-screened wells. These wells are screened below the water table to investigate contaminants associated with different depths.

A groundwater elevation survey was conducted in 2010 that consisted of 28 wells, including 12 shallow wells, 9 intermediate wells, and 7 deep wells. The groundwater contour map of the potentiometric surface using groundwater elevations from all of the wells in the survey, regardless of their screen depth, showed overall groundwater flow to the southwest. The steeper topography of Birch Hill, located northeast of the Landfill, and the extensive deep permafrost west of the Landfill likely influence groundwater flow for this scenario. Therefore, groundwater flow direction in the shallow/intermediate aquifer was looked at separately from the groundwater flow direction in the deep, subpermafrost aquifer. Groundwater elevations in the shallow/intermediate wells showed groundwater flow direction to the west; however, when wells influenced by or perched on permafrost were removed, the flow direction was to the southwest. Groundwater flow in the subpermafrost aquifer was determined to be to the west/southwest.

In 2010, Cold Regions Research and Engineering Laboratories (CRREL) conducted a task to define permafrost boundaries in the vicinity of the Landfill. The permafrost delineation and modeling identified discontinuous permafrost east of the Landfill, thick continuous permafrost west of the Landfill, and highly variable permafrost south of the Landfill (Figure 3-1). A thaw bulb is assumed to exist beneath the Landfill. During the 2011 field season CRREL ran additional geophysical profiles south of the Landfill which confirmed the presence of sporadic permafrost bodies in this area.

Groundwater levels measured during April 2015 were collected from wells screened across different elevations. Groundwater elevations were about 1 to 1.5 feet lower than October 2014 groundwater elevations. Water level measurements for 2015 are shown on Table 3-1. Although there are no stratigraphic confining layers separating shallow, intermediate, and deep wells, discontinuous permafrost is present in the monitored area, which can complicate flow patterns. An evaluation of groundwater elevations from all wells measured in April 2015 shows a relatively flat gradient with groundwater flow to the west/southwest (Figure 3-2), whereas the regional groundwater flow north of the Chena River is to the west/northwest. Groundwater elevations measured during the 1994 RI included a larger data set (E&E, 1995) and also showed groundwater flow to the southwest.

3.2 Groundwater Analytical Results for Landfill Monitoring Wells

Thirteen monitoring wells were sampled at the Landfill during April 2015: six shallow wells, three intermediate wells, and four deep wells. Six monitoring wells were sampled at the Landfill during November 2015: three shallow wells and three deep wells. Groundwater samples collected from wells using a screen that is placed so that at least five feet of the screen is below the water table and five feet of screen is above the water table are designated as shallow wells. These wells are sampled to investigate contaminants that migrate along the surface of the water table. Intermediate wells are screened below the groundwater table and above permafrost and are sampled to investigate the vertical distribution of contaminants in the unconfined groundwater that flows above permafrost. Several wells are screened below permafrost (deep wells). These wells are sampled to monitor contaminants that are migrating in the aquifer below the permafrost.

Groundwater analytical results for the spring and fall 2015 sampling events for VOC/SVOC and metals are presented in Table 3-2 and Table 3-3, respectively. Current and historical ROD COC concentrations are also presented on Figure 3-3. ROD COCs that exceed RAGs are listed below, and metals that exceed RAGs are discussed in Section 3.2.3.

- FWLF-4 – bis(2-ethylhexyl)phthalate
- AP-5588 – cis-1,2,-DCE, PCA, 1,1,2-Trichloroethane, and TCE
- AP-8061 – benzene and TCE
- AP-6532 – benzene and bis(2-ethylhexyl)phthalate
- AP-10257 – benzene and bis(2-ethylhexyl)phthalate

Benzene was detected in all wells except AP-10259 and AP-8063, and was detected at concentrations below the RAG in eight of the 13 wells sampled (it was non-detect in two wells and above the RAG in three wells).

A data quality review was performed, which indicated that all project data is acceptable for use, with the exception of four analytes (3-nitroaniline, 4-chloroaniline, hexachlorocyclopentadiene, and 3,3′-dichlorobenzidine) that were rejected in two to five samples due to quality control failures. However, the four affected analytes are not site COCs, so impact to the project is not significant. The data review also resulted in additional data qualifications, but overall the qualifications were minor and impact to the project was negligible. Details of the review are presented in the CDQR in Appendix B, and a Sample Tracking table and Analytical Results are provided in Appendix C.

3.2.1 Volatile Organic Compounds in Groundwater

Groundwater monitoring has been performed at the Landfill since 1997. A sufficient volume of data has been accumulated at most wells to support assessment of concentration trends over time. Figures 3-4 through 3-10 present COC concentrations in groundwater from the following wells for the time period since remedial action was implemented in 1997: AP-5588, AP-5589, AP-8063, AP-8061, AP-6138, FWLF-4, and AP-6532 (formerly identified as DH-6534). Well AP-8061 replaced well AP-6137 in September 2001. Monitoring well AP-8061 was installed in the same location and to the same depth and screen interval as well AP-6137; therefore, the data from these wells were combined for data analysis.

Shallow Monitoring Wells

Downgradient well AP-5588 (Figure 3-4). AP-5588 has historically exhibited the highest COC concentrations for TCE, cis-1,2-DCE, PCA, and 1,1,2-trichloroethane above RAGs. While these COC exhibit an overall decreasing trend, each of these COCs increased during the 2015 sampling event. Benzene is typically detected in AP-5588, but has never been detected above the RAG.

Downgradient Well AP-8061 (Figure 3-5). Historically, benzene and TCE have been the only contaminants detected at concentrations exceeding the RAGs in AP-8061. Benzene decreased to below the RAG in October 2011 and remained below the RAG for six sampling events, until November 2015 when it was detected slightly above the RAG (5 µg/L) at 5.4 µg/L. TCE decreased to below the RAG in fall 2012 and remained below the RAG (5 µg/L) until fall 2014, when it was detected at 7.8 µg/L. TCE was below the RAG in April 2015 and above the RAG during the November 2015 sampling event at a concentration of 7.0 µg/L. Cis-1,2-DCE, the only other COC that is consistently detected in this well, has always been below the RAG and is decreasing.

Upgradient wells FWLF-4, AP-10257, AP-10258, and AP-10259. Benzene has been consistently detected in FWLF-4 since sampling began at this well in 1998; however, benzene has never been detected above the RAG. Three shallow upgradient wells (AP-10257, AP-10258, and AP-10259), originally associated with the Building 1191 leach field, have been sampled each year since they were installed in 2012. Benzene and bis(2-ethylhexyl phthalate) are the only ROD COCs that have been detected above the RAG in these wells. Benzene has been above the RAG in well AP-10257 during each sampling event, with the exception of June 2013, ranging from 6.6 µg/L in fall 2014 to 17 µg/L in fall 2013. Bis(2-ethylhexyl phthalate) was also detected above the RAG in AP-10257 in 2015 for the first time since sampling began at this well. Benzene was detected above the RAG in AP-10258 for the first time during the fall 2014 sampling event at 5.7 µg/L, but was below the RAG during both the April and November 2015 sampling events. It is most likely that the benzene detected in these wells is associated with the Landfill debris and it is not migration from the Building 1191 septic system. No COCs have ever been detected above the RAG in AP-10259 and this well was removed from the Landfill monitoring network following the April 2015 sampling event.

Intermediate Monitoring Wells

Downgradient Well AP-5589 (Figure 3-6). Concentrations of benzene, cis-1,2-DCE, vinyl chloride, and TCE are consistently detected at concentrations below the RAGs in AP-5589, which is collocated with shallow well AP-5588. TCE in AP-5589 was detected slightly above the RAG during the spring 2007 and fall 2009 sampling events but has been just below the RAG during all other sampling events. PCA in AP-5589 was detected above the RAG between 2005 and 2007, with the highest concentration (25.2 µg/L) ever detected in spring 2007. PCA decreased to below the RAG during fall 2007 and has remained below the RAG with the exception of one detection of 5.6 µg/L in spring 2009. Vinyl chloride has been detected above the RAG three times since 1997 and concentrations range from not detected to slightly above the RAG of 2 µg/L; it has not been detected above the RAG since 2006.

Downgradient Wells AP-6138 and AP-6136. Benzene is consistently detected in AP-6138 and AP-6136 below the RAG of 5 µg/L. VOCs have never been detected above RAGs in either of these wells and both wells were removed from the Landfill monitoring network following the April 2015 sampling event.

Deep Monitoring Wells

Downgradient Monitoring Well AP-8063 (Figure 3-7). This well has been sampled since September 2001. TCE, PCA, and cis-1,2-DCE have historically been detected at elevated concentrations in AP-8063. Anomalous results occurred in 2004, 2009 and again during the April 2015 sampling event when TCE, PCA, and cis-1,2-DCE were not detected. TCE was detected at its highest concentration to date during 2014, at 29 µg/L; however, overall TCE concentrations have been relatively stable, between 15 and 30 µg/L. Cis-1,2-DCE has shown an overall increasing trend, and was also detected at its highest concentration to date in 2014, at 120 µg/L. PCA concentrations decreased and generally remained below the RAG between 2004 and 2007, when PCA again increased to above the RAG. The PCA concentration peaked in spring 2011 at 61 µg/L and has shown a decreasing trend since then. The sampling frequency of AP-8063 was decreased to annually following the spring 2015 sampling event; however, because of the anomalous results, the sampling frequency will return to biannually in 2016.

Downgradient Monitoring Well AP-6532 (formerly identified as DH 6534) (Figure 3-8). Benzene in well AP-6532 exceeded the RAG during the June 2004 sampling event for the first time since sampling at this well began in 1997, and remained above the RAG for eight sampling events. Benzene, which was below the RAG during both 2009 sampling events, increased to historical high concentrations during 2010 and 2011, then decreased to below the RAG in 2012. Benzene was again above the RAG during both the June and September 2013 sampling events, and was detected at its highest concentration to date, 13 µg/L, during the fall 2014 sampling event. Benzene decreased slightly in 2015 to 11 µg/L during both the spring and fall sampling events. Overall, benzene in this well appears to be increasing.

One non-ROD contaminant, 2,6-dinitrotoluene (2,6-DNT), was also detected above the ADEC cleanup level in well AP-6532 during the 2015 spring and fall sampling events. 2,6-DNT was detected above the cleanup level in the same well during the spring and fall sampling events in 2013. The source of 2,6-DNT at the Fort Wainwright landfill area cannot be conclusively determined. However, common uses of DNT include the manufacturing of munitions, polyurethane polymers, and herbicides, which may be associated with the landfill contents. 2,6-DNT detected in groundwater samples from the Landfill site are discussed further in Section 2.11 of the CDQR in Appendix B.

Downgradient Monitoring Wells AP-6530 (Figure 3-9) and AP-6535. Two deep downgradient wells, AP-6535 and AP-6530, were added to the Landfill monitoring network in 2010 to monitor the downgradient migration of benzene in the subpermafrost aquifer. These are currently the farthest downgradient monitoring wells associated with the Landfill monitoring network. Benzene has exceeded the RAG in three out of nine sampling events at AP-6530 and was detected below the RAG during the fall 2014 and the spring and fall 2015 sampling events. Benzene has been detected below the RAG in AP-6535 during each sampling event since 2010.

Contaminant Flow Paths

Benzene

Benzene is detected in all wells sampled downgradient of the landfill, typically at concentrations below the RAG; however, benzene is detected above the RAG in three wells: deep downgradient wells AP-6532 (total depth (TD) 177 ft) and AP-6530 (TD 142 ft), and shallow well AP-8061 (TD 25 ft). It appears that benzene is migrating below permafrost at concentrations exceeding RAGs in a predominately westerly flow path. Figure 3-10 shows benzene concentrations along a westerly flow path downgradient of the Landfill. Benzene is not seen at concentrations exceeding the RAG in deep downgradient wells AP-8063 (TD 120 ft), AP-6534 (total depth 198 ft) or AP-6535 (TD 93 ft) that are along a southwesterly flow path. It is possible that the permafrost beneath the Landfill is discontinuous and benzene has migrated through permafrost; however, the presence of or depth to permafrost beneath the Landfill is unknown, and it is not known how permafrost affects groundwater flow at depth. AP-8061 is a shallow well located within a thaw channel downgradient of the landfill. It appears that benzene is migrating at the water table within this thawed area southwest of the landfill.

Chlorinated Solvents

Chlorinated solvents PCA, TCE, 1,2- DCE and 1,1,2-trichloroethane are less widespread than benzene in groundwater downgradient of the landfill and appear to be more prevalent on a southwesterly flow path as seen in nested wells AP-5588 (shallow) and AP-5589 (intermediate) and deep wells AP-8063 and AP-6535. Except for 1,2- DCE, chlorinated solvents are not seen in deep wells AP-6532 and AP-6530. Figure 3-11 shows migration of chlorinated solvents along a southwesterly flow path. Specific sources of contamination within the landfill have not been investigated and it is possible that the chlorinated solvents originate from a separate spill than the petroleum contaminants. It appears that chlorinated solvents migrate at the water table downgradient of the landfill until permafrost is encountered, when they continue migrating below permafrost.

3.2.2 SVOCs in Groundwater

Bis(2-ethylhexyl)phthalate is an OU4 COC that is common in the environment because of its use in plastics. It is detected at low levels in most of the Landfill wells and it will periodically exceed the RAG. There are no established contaminant trends for Bis(2-ethylhexyl)phthalate.

Bis(2-ethylhexyl)phthalate was above the RAG in FWLF-4 during the spring 2015 sampling event and in AP-6432 in both the spring and fall 2015 sampling events; however, the last time this COC was above the RAG in either of these wells was in 2003. Bis(2-ethylhexyl)phthalate was also above the RAG in the field duplicate sample collected during the fall 2015 at AP-10257; however, it was not detected in the primary sample.

It is expected that Bis(2-ethylhexyl)phthalate at OU4 is migrating from the landfill; however, the specific source is unknown. Bis(2-ethylhexyl)phthalate is common in the environment because of its use in plastics. Sampling and laboratory equipment, monitoring wells, and waste disposed in landfills may contain or be constructed of plastics. Bis(2-ethylhexyl)phthalate is also used in inks, adhesives, coatings, pesticides, cosmetics, vacuum pump oil and as a dielectric fluid in ballast capacitors and other electrical equipment (e.g., transformers). It has low solubility in water (300 - 400 µg/L), is soluble in most organic solvents, and evaporates slowly into the air. It has not been shown to degrade in anaerobic conditions, such as landfill leachate.

3.2.3 Metals in Groundwater

Groundwater samples collected at the Landfill were analyzed for a total of 15 trace metals in compliance with solid waste permit requirements. Groundwater analytical results showed that arsenic and nickel were the only trace metals detected above RAGs as listed in Title 18 Alaska Administrative Code (AAC) 75.345 (ADEC, 2016). Background concentrations of arsenic in groundwater at Fort Wainwright have previously been shown to exceed the RAG (USACE, 1993). Table 3-3 presents the 2015 groundwater monitoring results for the 15 trace metals typically reported for the Landfill.

Arsenic was above the RAG of 10 µg/L in downgradient shallow monitoring well AP-5588 at a concentration of 18 µg/L and in deep monitoring well AP-6532 at 14 µg/L during the spring 2015 sampling event. Arsenic is also frequently detected in other wells in the monitoring network at concentrations below the RAG. These results suggest that the arsenic is a consequence of natural mineral deposits known to occur in bedrock in the Fairbanks area. Nickel was detected above the RAG during the spring and fall 2015 sampling events in well AP-10258. The source of the nickel is not known; however, it is assumed to be associated with the active portion of the Landfill.

3.2.4 Natural Attenuation of Chlorinated and Petroleum Hydrocarbon Contaminants

3.2.4.1 Formation of PCA Degradation Products

The biodegradation processes most important to the natural attenuation of chlorinated contaminants is reductive dechlorination. The presence of PCA daughter products TCE, 1,1,2-trichloroethane, 1,2-DCE, and vinyl chloride in downgradient monitoring wells is consistent with the occurrence of reductive dechlorination. Three reductive dechlorination reaction pathways are common under anaerobic conditions – an abiotic dehydrochlorination reaction that produces TCE; a hydrogenolysis pathway that produces 1,1,2-trichloroethane and 1,2-DCA; and a dichloroelimination pathway that produces 1,2-DCE (both cis- and trans- isomers) and vinyl chloride. Vinyl chloride may undergo further reductive dechlorination reactions to non-toxic ethene (USGS, 2012).

Hydrogenolysis entails the sequential replacement of a single chlorine atom by hydrogen, whereas dichloroelimination entails the simultaneous replacement of two adjacent chlorine atoms by hydrogen to produce a double bond. For these reductive dechlorination reactions, the chlorinated compound serves as an electron acceptor, resulting in production of more reduced, less-chlorinated daughter compounds. Microorganisms require the presence of suitable electron donors for reductive dechlorination to occur. Possible electron donors include natural compounds such as hydrogen, acetate, and methanol, and anthropogenic organic compounds such as benzene and toluene. Dechlorination of PCA and TCE to DCE can occur under mildly reducing conditions, similar to conditions suitable for iron reduction; whereas, the dechlorination of DCE to vinyl chloride to ethene typically requires the stronger reducing conditions suitable for sulfate-reduction or methanogensis.

In addition to reductive dechlorination of vinyl chloride, anaerobic oxidation or mineralization of vinyl chloride to carbon dioxide (CO2) or to CO2 and methane (CH4) has been reported under iron-reducing, sulfate-reducing, humic acid-reducing and methanogenic conditions. For these reactions, the vinyl chloride serves as an electron donor (USGS, 2012).

Chemical and geochemical data including the concentrations of PCA, daughter products, and terminal electron acceptors (dissolved oxygen, manganese, iron, sulfate, etc.) provide evidence to evaluate the feasibility of bioremediation as a remedial alternative. Environmental conditions that support natural attenuation processes for chlorinated compounds (particularly reductive dechlorination) include:

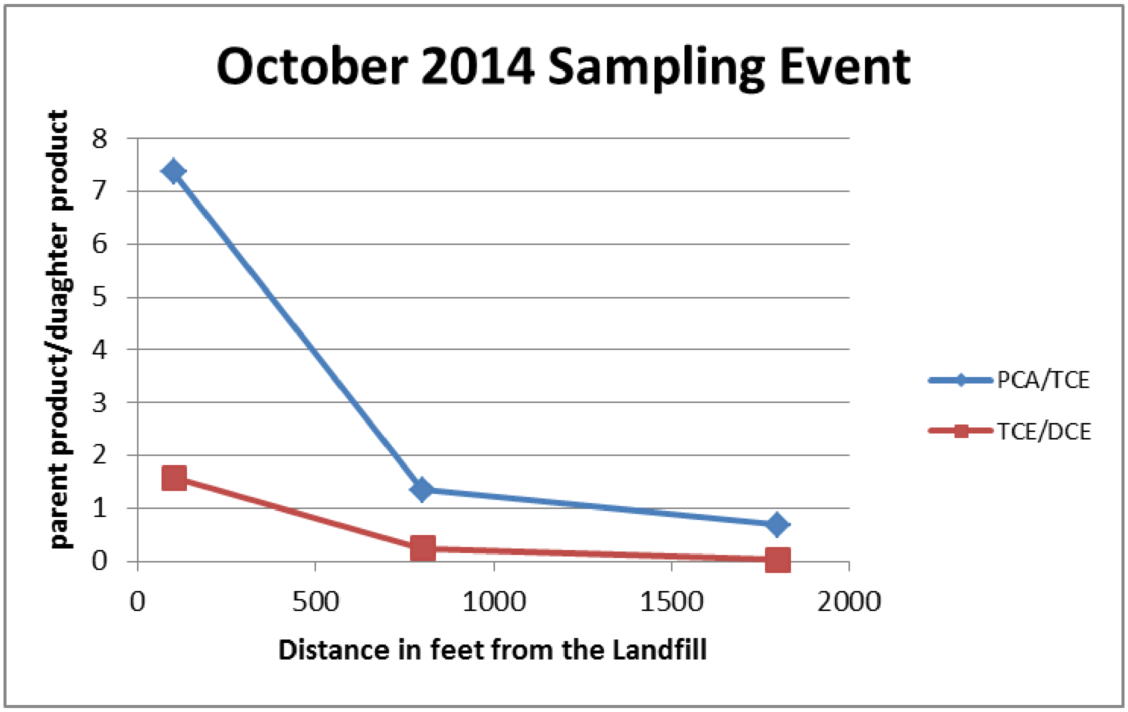
- microorganisms capable of degrading the contaminants
- oxidation-reduction (redox) capacity of the groundwater
- sufficient electron donors (e.g., a carbon source)
- minimal competing electron acceptors

3.2.4.2 PCA Degradation Products in Groundwater

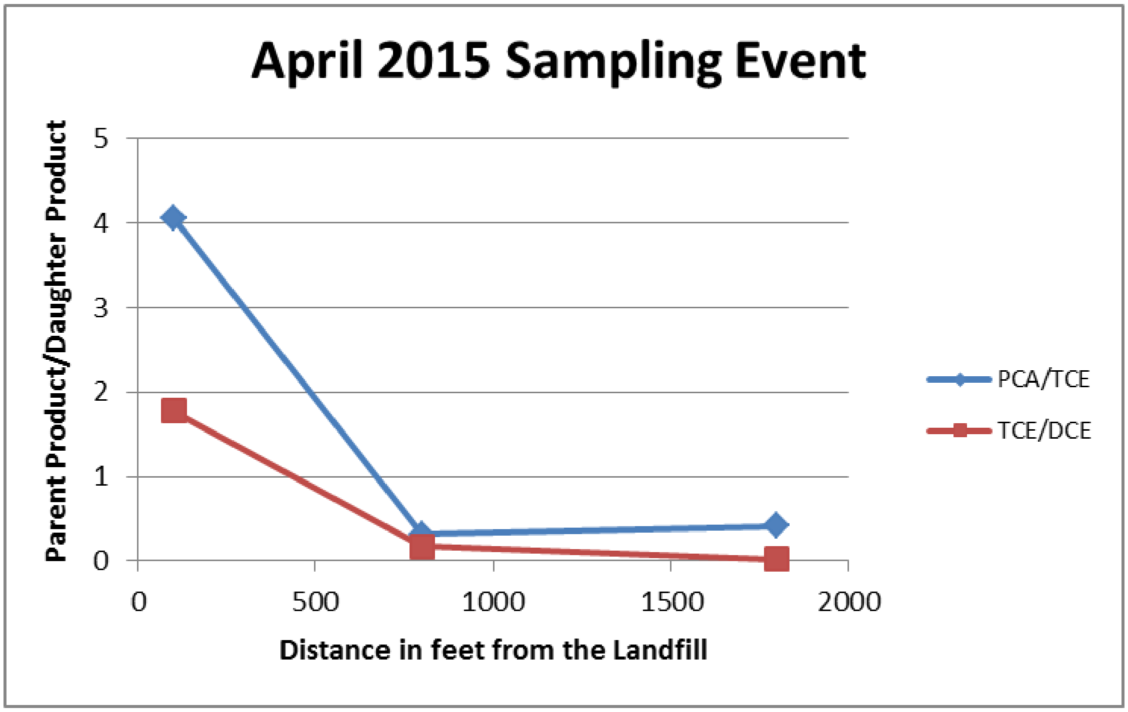
The highest concentrations of PCA, TCE, and DCE are detected in well AP-5588 (located immediately downgradient of the inactive portion of the Landfill), and PCA concentrations have historically been one order of magnitude greater than TCE concentrations in this well. It is unknown whether TCE or DCE are present in groundwater primarily due to a release at the site or if they were formed through reductive dechlorination of PCA. In part this is due to not having true source area wells, since it is not practical to install wells within the Landfill cap. Therefore, wells are located at varying distances downgradient of the Landfill

Although the concentrations of all contaminants decrease with distance from the Landfill, as would be expected through natural attenuation and dilution, the ratios of parent to daughter products (i.e., PCA/TCE and TCE/DCE) also show decreasing trends, as shown in Graphs 3-1 and 3-2. Graphs 3-1 and 3-2 depict the ratios of parent to daughter products during October 2014 and April 2015 sampling events, respectively, along the southwesterly flow path encompassing wells AP-5588, AP-8063, and AP-6535 (as shown on cross-section Figure 3-11). These decreasing ratios indicate that parent product concentrations are decreasing at a faster rate than daughter product concentrations with distance from the source area, suggesting that dechlorination is occurring.

Graph 3-1 Parent to Daughter Product Ratios with Distance from the Landfill (October 2014)



Graph 3-2 Parent to Daughter Product Ratios with Distance from the Landfill (April 2015)



3.2.5 Geochemical Data Evaluation

Groundwater geochemical data were collected during the 2015 spring and fall sampling events to facilitate natural attenuation evaluations. Geochemical data indicates that natural attenuation of site contaminants is occurring and iron and sulfate reduction processes appear to be the most important biodegradation pathways. The following are interpretations based on data collected 2005 through 2015 for wells located downgradient of the landfill.

- DO concentrations are generally less than 2 milligrams per liter (mg/L) and indicate that the aquifer is anaerobic.
- Background concentrations for dissolved iron are typically at trace concentrations (near 0 mg/L) in groundwater at Fort Wainwright. During the 2015 sampling events, dissolved iron concentrations in wells downgradient of the Landfill ranged from 20 mg/L to 50 mg/L. Iron was not detected in three upgradient wells. The dissolved iron concentrations in downgradient wells continue to remain elevated, indicating a redox potential range suitable for iron reduction.
- Background concentrations for sulfate typically range from 20 mg/L to 30 mg/L in groundwater at Fort Wainwright. During the 2015 sampling events, sulfate concentrations in upgradient wells ranged from 110 mg/L to 270 mg/L, which is substantially above background concentrations. Sulfate concentrations in downgradient wells were typically lower and ranged from 2.3 mg/L in AP-6532 (deep well) to 190 mg/L in AP-5588 (shallow well). The average sulfate concentration in downgradient wells was 37 mg/L; a decrease of

an order of magnitude from what is observed in upgradient wells. The decrease in sulfate concentrations relative to upgradient well concentrations, indicate a redox potential range suitable for sulfate reduction in the downgradient wells.

3.2.5 Methane in Groundwater

Methane is produced through anaerobic biodegradation processes of a variety of carbonaceous compounds common to landfill wastes. Permafrost degradation can also result in the release of methane to groundwater, as wells as through anaerobic oxidation or mineralization of vinyl chloride (as discussed in Section 3.2.4.1). Methane is a colorless, odorless, tasteless gas that can be transported by groundwater in dissolved or pure gaseous states. The solubility of methane in water can range between 35,000 µg/L at 4 degrees Celsius (°C) and 39,000 µg/L at 0 °C (Speight, 2005). When water containing dissolved methane comes into contact with air, the methane readily escapes from the groundwater into the vadose zone and into the atmosphere.

Methane was detected in every well sampled during 2015 except for upgradient well AP-10259. Methane concentrations in wells downgradient of the Landfill ranged from 110 µg/L in AP-6136 (intermediate well) to 3,600 µg/L in AP-6532 (deep well) at comparable temperatures. The methane concentrations detected in these wells were similar to methane concentrations in shallow upgradient wells AP-10257MW (2,300 µg/L) and AP-10258MW (680 µg/L). Since elevated methane concentrations are observed in both upgradient and downgradient wells, as well as at varying well depths, it is likely that methane production is stemming from multiple degradation processes.

Table 3-1 Groundwater Elevations Measured in 2015

Well Number	Total Depth (below TOC)	Screened Interval (feet bgs)	Relative Depth	TOC Elevations	Depth to Water from TOC April 2015	Groundwater Elevation April 2015	Depth to Water from TOC November 2015	Groundwater Elevation November 2015
FWLF-4	25.10	13.5-23.5	Shallow	452.23	17.93	434.3	NA	NA
AP-5588	29.05	7-27	Shallow	451.13	17.00	434.13	NA	NA
AP-5589	56.41	47.5-57.5	Intermediate	452.13	17.98	434.15	NA	NA
AP-6136	96.10	82-92	Intermediate	453.93	19.74	434.19	NA	NA
AP-8061	25.29	15-25	Shallow	444.13	10.07	434.06	7.71	436.42
AP-6138	86.12	75-85	Intermediate	444.73	10.67	434.06	NA	NA
AP-8063	116.30	110-120	Deep	451.21	17.33	433.88	NA	NA
AP-6532	173.65	170-177	Deep	451.17	17.46	433.71	14.92	436.25
AP-6530	136.24	136.2-142.2	Deep	450.06	16.70	433.36	14.02	436.04
AP-6535	90.75	87.1-93.1	Deep	448.09	14.95	433.14	12.35	435.74
AP-10257	24.45	11.5-21.5	Shallow	454.01	19.65	434.36	17.25	436.76
AP-10258	23.80	11-21	Shallow	453.54	19.15	434.39	16.77	436.77
AP-10259	23.45	10.5-20.5	Shallow	453.95	19.60	434.35	NA	NA

Notes:

bgs - below ground surface
TOC - top of casing
NA - not available
NI - not installed

Table 3-2 Landfill Analytical Results - Volatile and Semi-Volatile Organic Compounds

Well Number	Sample ID	Sample Date	Survey Elevation	Water Level	Groundwater Elevation	Iron (II) (mg/L)	Sulfate (mg/L)	Methane (µg/L)	Benzene (µg/L)	cis-1,2-DCE (µg/L)	1,1,2,2-PCA (µg/L)	1,1,2-Trichloro-ethane (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	bis(2-Ethylhexyl)phthalate (µg/L)
RAOs in µg/L						**NA**	**NA**	**NA**	**5**	**70**	**5.2**	**5**	**5**	**2**	**6**
FWLF-4	13FW414WG	6/18/2013	452.23	16.16	436.07	32	53	120	0.52 J	0.26 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	0.66 J
	13FW430WG	9/11/2013	452.23	17.83	434.4	28	49	220	0.4 J	0.19 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	0.8 J
	14FWOU416WG	10/21/2014	452.23	16.16	436.07	27	47	190	1.2	0.47	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	**13**
	15FWOU401WG	4/7/2015	452.23	17.93	434.3	28	50	120	0.88 J	0.29 J	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	**9.5**
AP-5588	13FW410WG	6/17/2013	451.13	15.21	435.92	25	160	1,100	1.4 J	**110**	**940**	4.7	**130**	0.45 J	0.61 J
	13FW411WG [1]					24	160	1,000	1.3 J	**110**	**850**	4.2	**120**	0.51 J	0.69 J
	13FW425WG	9/10/2013	451.13	16.93	434.2	30	130	1,600	1.5 J	**100**	**960**	3.8 J	**140**	0.96 J,Q	ND(0.27)
	13FW426WG [1]					29	130	1,700	ND(2.0)	**110**	**980**	4.2 J	**150**	ND(4.0)	ND(0.27)
	14FWOU402WG	10/20/2014	451.13	15.38	435.75	23	150	1,400	0.76	**120**	**1300**	**5.4**	**190**	0.4	ND(2.0)
	14FWOU404WG[1]					23	26	1,200	0.99	**130**	**1400**	**5.8**	**210**	0.49 J	ND(2.0)
	15FWOU407WG	4/7/2015	451.13	17	434.13	37	190	1,800	1.8	**180 J**	**1300 J**	**10**	**320**	0.87 J	1.2 J
AP-5589	13FW409WG	6/17/2013	452.13	16.2	435.93	40	130	1,700	3	16	ND(0.40)	ND(0.40)	4.5	0.60 J	**23**
	13FW427WG	9/10/2013	452.13	17.9	434.23	47	140	4,200	2.4	14	ND(0.40)	ND(0.40)	3.6	0.71 J	ND(0.2)
	14FWOU406WG	10/20/2014	452.13	16.35	435.78	45	110	4,100	3.3	16	1.5	ND(0.40)	4.9	0.88	ND(0.3)
	15FWOU409WG	4/7/2015	452.13	17.98	434.15	50	120	3,400	3.3	14	2	ND(0.50)	4.6	1.1	ND(1.9)
AP-6136	13FW404WG	6/17/2013	453.93	17.91	436.02	17	0.61	160	0.16 J	ND(0.20)	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	
	13FW428WG	9/11/2013	453.93	19.91	434.02	17	1.2 J	210	0.21 QH	ND(0.20)	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	0.96 J
	14FWOU410WG	10/21/2014	453.93	18.25	435.68	19	2.8	130	0.53	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	6.8
	15FWOU410WG	4/8/2015	453.93	19.74	434.19	22	4.3	110	0.74 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	ND(2.2)
AP-8061	13FW413WG	6/17/2013	444.13	8.35	435.78	22	34	260	2.9	8.6	ND(0.40)	ND(0.40)	4.4	0.13 J	0.79 J
	13FW423WG	9/10/2013	444.13	10	434.13	30	32	600	3.9	7.3	ND(0.40)	ND(0.40)	3.8	0.15 J	0.81 J
	14FWOU401WG	10/20/2014	444.13	8.6	435.53	23	37	560	3.9	13	ND(0.40)	ND(0.40)	**7.8**	ND(0.40)	ND(1.9)
	15FWOU405WG	4/7/2015	444.13	10.07	434.06	34	33	440	3.9	8.9	ND(0.50)	ND(0.50)	4.5	ND(0.50)	ND(1.9)
	15FWOU418WG	11/6/2015	444.13	7.71	436.42	30	40	630	**5.4**	9.7	ND(0.50)	ND(0.50)	**7**	ND(0.50)	ND(2.1)
AP-6138	13FW412WG	6/17/2013	444.73	8.98	435.75	18	0.23	91	2.8	0.39 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	0.76 J
	13FW423WG	9/10/2013	444.73	10.59	434.14	18	7.5	160	2.23	0.25 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	ND(0.2)
	14FWOU403WG	10/20/2014	444.73	9.23	435.5	19	8.1	160	2.5	0.38	0.75	ND(0.40)	ND(0.40)	ND(0.40)	ND(2.9)
	15FWOU403WG	4/7/2015	444.73	10.67	434.06	25	13	190	3.2	0.53 J	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	ND(1.9)
AP-6532	13FW418WG	6/19/2013	451.17	16.15	435.02	26	ND(0.50)	2,200	**11**	2.3	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	1.1 J,B
	13FW435WG	9/17/2013	451.17	16.7	434.47	30	ND(0.50)	5,900	**9.2**	2.4	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	1.6 J
	14FWOU414WG	10/22/2014	451.17	16.14	435.03	27	ND(0.50)	4,300	**13**	2.4	ND(0.40)	ND(0.40)	ND(0.4)	ND(0.40)	ND(2.9)
	15FWOU402WG	4/7/2015	451.17	17.46	433.71	28	2.3	3,600	**11**	2.4	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	**20**
	15FWOU424WG	11/9/2015	451.17	14.92	436.25	27	3.4	1,500	**11**	2.8	ND(0.50)	ND(0.50)	ND(1)	0.25 J	**19**
AP-8063	13FW406WG	6/17/2013	451.21	15.61	435.6	49	120	2,800	2.5	**93**	**46**	0.95 J	**25**	0.98 J	2.0 J,B
	13FW433WG	9/16/2013	451.21	16.56	434.65	45	120	4,100	2.0	**83**	**43**	1.0	**21**	0.82 J	1.8 J,Q
	13FW434WG [1]					46	120	4,700	1.8	**76**	**42**	0.87 J	**19**	0.76 J	2.5 J,Q
	14FWOU407WG	10/20/2014	451.21	15.87	435.34	55	120	3,100	2.6	**120**	**39**	0.79	**29**	1.3	ND(1.9)
	14FWOU408WG[1]					56	120	3,900	2.6	**120**	**35**	0.78	**30**	1.3	ND(1.9)
	15FWOU411WG	4/8/2015	451.21	17.33	433.88	23	4.6	2,100 J	ND(1)	4.5	ND(0.50)	ND(0.50)	0.78 J	ND(0.50)	2.8 J
	15FWOU412WG[1]					24	4.3	1,500	ND(1)	4.6	ND(0.50)	ND(0.50)	0.72 J	ND(0.50)	5.7
AP-6530	13FW415WG	6/18/2013	450.06	15.22	434.84	25	38	2,800	**5.8**	1.8 J	ND(0.40)	ND(0.40)	ND(0.20)	0.31 J	1.3 J,B
	13FW431WG	9/16/2013	450.06	15.82	434.24	27	37	3,900	**5**	1.6	ND(0.40)	ND(0.40)	ND(0.20)	0.27 J	1.1 J
	14FWOU405WG	10/20/2014	450.06	15.25	434.81	23	26	530	3.2	0.42	0.89	ND(0.40)	ND(0.40)	ND(0.40)	**27**
	15FWOU406WG	4/7/2015	450.06	16.7	433.36	24	21	330	3	0.62 J	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	ND(2.2)
	15FWOU422WG	11/6/2015	450.06	14.02	436.04	20	16	120	1.9	0.26 J	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	3.5
AP-6535	13FW408WG	6/17/2013	448.09	13.39	434.7	26	14	1,100	3.3	33	ND(0.40)	ND(0.40)	0.95	0.86 J	1.1 J,B
	13FW432WG	9/16/2013	448.09	13.99	434.1	25	10	2,100	2.1	22	ND(0.40)	ND(0.40)	0.33 J	0.66 J	0.95 J
	14FWOU412WG	10/21/2014	448.09	13.7	434.39	28	13	1,800	3.3	34	ND(0.40)	ND(0.40)	0.73	1.1	2.3
	15FWOU404WG	4/7/2015	448.09	14.95	433.14	28	13	1,100	3	31	ND(0.50)	ND(0.50)	0.55 J	1	ND(2.3)
	15FWOU425WG	11/9/2015	448.09	12.35	435.74	29	18	1,600	3.4	33 J	ND(0.50)	ND(0.50)	0.6 J	ND(0.5)	ND(2)
	15FWOU426WG[1]					30	18	1,300	3.4	33	ND(0.50)	ND(0.50)	0.59 J	ND(0.5)	ND(2.1)
AP-10257MW	13FW405WG	6/17/2013	454.01	17.79	436.22	9.0 QL	79	46	3.4	1.6	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	1.1 J
	13FW429WG	9/11/2013	454.01	19.61	434.4	3.7	26	1,200	**17**	3.9	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	1.1 J
	14FWOU413WG	10/21/2014	454.01	17.7	436.31	0.23	120	300	**6.6**	2	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(2.0)
	14FWOU415WG[1]					0.29	120	330	**7**	2	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(2.2)
	15FWOU413WG	4/8/2015	454.01	19.65	434.36	2.4	22	2,300 J	**14**	3.1	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	2.1 J
	15FWOU414WG[1]					2.5	23	2,500	**14**	3.3	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	4.1
	15FWOU420WG	11/6/2015	454.01	17.25	436.76	ND(0.36)	270	2,700	**7.4**	3.1	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	ND(2.1)
	15FWOU421WG[1]					ND(0.36)	270	2,300	**5.3**	1.9	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	**14**
AP-10258MW	12FW436WG	11/14/2012	453.54	19.2	434.34	0.7	140	15	ND(0.20)	0.45 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.80)	0.98 J
	13FW401WG	6/17/2013	453.54	17.32	436.22	6.1	98	44	ND(0.20) Q	0.39 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	0.76 J
	13FW402WG [1]					6.5	97	43	0.40 J,Q	0.39 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	0.74 J
	13FW421WG	9/10/2013	453.54	19.12	434.42	0.58	100	150	2.6	1.6	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	ND(0.26)
	13FW422WG [1]					0.61	92	160	2.7	1.7	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	ND(0.26)
	14FWOU409WG	10/21/2014	453.54	17.25	436.29	ND(0.50)	160	280	**5.7**	2.5	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	ND(2.9)
	15FWOU408WG	4/8/2015	453.54	19.15	434.39	ND(0.36)	110	480	4.9	3.5	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	ND(1.9)
	15FWOU419WG	11/6/2015	453.54	16.77	436.77	ND(0.36)	120	680	3.4	2.9	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	ND(2.0)
AP-10259MW	13FW403WG	6/17/2013	453.95	17.64	436.31	6.4	120	50	0.7 J	0.37 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	1.3 J,B
	13FW420WG	9/10/2013	453.95	19.51	434.44	0.82	110	17	0.18 J	ND(0.20)	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.40)	ND(0.26)
	14FWOU411WG	10/21/2014	453.95	17.38	436.57	ND(0.20)	76	0.25	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(2.0)
	15FWOU415WG	4/8/2015	453.95	19.6	434.35	ND(0.36)	120	ND(0.37)	ND(1)	ND(0.50)	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	ND(1.9)

Notes:

Results in bold and yellow shading denote concentrations above the RAOs established in the ROD (USARAK, 1996)

[1] Sample is a field duplicate of the sample immediately above.

B - analyte was detected in a blank at a similar concentration and may be due to cross-contamination

DCE - cis-1,2-dichloroethene

J - result qualified as estimate because it is less than the LOQ

M - result considered an estimate (L-low; H-high) due to matrix interference

µg/L - micrograms per liter

ND - not detected at the detection limit (LOD in parentheses for 2012 results. LOQ in parentheses for data prior to 2012.)

PCA - 1,1,2,2-tetrachloroethane

Q - result considered an estimate (L-low; H-high) due to a quality control failure

RAO - remedial action ojectives

TCE - trichloroethene

Table 3-3 Landfill Analytical Results - Trace Metals

Well Number	Sample ID	Sample Date	Antimony (μg/L)	Arsenic (μg/L)	Barium (μg/L)	Beryllium (μg/L)	Cadmium (μg/L)	Chromium (μg/L)	Cobalt (μg/L)	Copper (μg/L)	Lead (μg/L)	Nickel (μg/L)	Selenium (μg/L)	Silver (μg/L)	Thallium (μg/L)	Vanadium (μg/L)	Zinc (μg/L)
		MCLs in μg/L	**6**	**10**	**2,000**	**4**	**5**	**100**	**NA**	**1,000**	**15**	**100**	**50**	**180**	**2**	**260**	**5,000**
FWLF-4	13FW414WG	6/18/2013	ND(0.60)	12	390	ND(0.24)	ND(0.12)	0.57 J	5.2	2.7	ND(0.50)	9.5	ND(2.0)	ND(0.10)	ND(0.20)	0.84 J	4.2 J,B
	13FW430WG	9/11/2013	ND(0.60)	9.8	360	ND(0.24)	ND(0.12)	ND(1.5)	3.5	ND(1.5)	ND(0.50)	3.6	ND(2.0)	ND(0.10)	ND(0.20)	0.77 J	2.5 J
	14FWOU416WG	10/21/2014	ND(0.40)	9.5 J	310	ND(0.40)	ND(0.10)	0.72 J	6.3 J	1	0.12 J	7	ND [1.6]	ND [0.10]	ND(1)	ND(2)	5.9 J
	15FWOU401WG	4/7/2015	ND(1)	5.7	360	ND(1.3)	ND(0.3)	ND(1.5)	6.1	4.9 J	ND(0.5)	6.7 J	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
AP-5588	13FW410WG	6/17/2013	ND(0.60)	**17**	590	ND(0.24)	ND(0.12)	0.96 J	1.5	0.76 J	ND(0.50)	7.2	ND(2)	ND(0.10)	ND(0.20)	2.3 J	4.9 J,B,Q
	13FW411WG [1]		ND(0.60)	**17**	550	ND(0.24)	ND(0.12)	1.2 J	1.7	0.78 J	ND(0.50)	8	ND(2.0)	ND(0.10)	ND(0.20)	2.3 J	2.0 J,B,Q
	13FW425WG	9/10/2013	ND(0.60)	**11**	510	ND(0.24)	ND(0.12)	0.70 J	1.3	ND(1.5)	ND(0.50)	4.4	ND(2.0)	ND(0.10)	ND(0.20)	1.8 J	ND(6.0) Q
	13FW426WG [1]		ND(0.60)	**11**	530	ND(0.24)	ND(0.12)	0.58 J	0.6	ND(1.5)	ND(0.50)	4.2	ND(2.0)	ND(0.10)	ND(0.20)	1.5 J	2.3 J,Q
	14FWOU402WG	10/20/2014	ND(0.40)	**15**	510	ND(0.40)	ND(0.10)	1.1	3.5	0.67 J	0.14 J	6.5	ND [1.6]	ND [0.10]	ND(1)	2.2 J	4 J
	14FWOU404WG[1]		ND(0.40)	**15**	540	ND(0.40)	ND(0.10)	3.6	3.6	0.85 J	0.16 J	7.1	ND [1.6]	ND [0.10]	ND(1)	2.2J	5.7 J
	15FWOU407WG	4/7/2015	ND(1)	**18**	460	ND(1.3)	ND(0.3)	1.1 J	2.4	ND(7.5)	ND(0.5)	3.9 J	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
AP-5589	13FW409WG	6/17/2013	ND(0.60)	1.1 J	590	ND(0.24)	ND(0.12)	1.4 J	0.15 J	ND(1.5)	ND(0.50)	0.72 J	ND(2.0)	ND(0.10)	ND(0.20)	4.3 J	ND(6.0)
	13FW427WG	9/10/2013	ND(0.60)	0.87 J	579	ND(0.24)	ND(0.12)	1.3 J	0.15 J	ND(1.5)	0.23 J	0.95 J	ND(2.0)	ND(0.10)	ND(0.20)	4.0 J	ND(6.0)
	14FWOU406WG	10/20/2014	ND(0.40)	ND(1.6)	620	ND(0.40)	ND(0.10)	1.9	0.18 J	0.67 J	0.19 J	1.1 J	ND [1.6]	ND [0.10]	ND(1)	4.7	ND [4]
	15FWOU409WG	4/7/2015	ND(1)	ND(4)	640	ND(1.3)	ND(0.3)	1.5 J	0.21 J	ND(7.5)	0.49 J	ND(5)	ND(4)	ND(0.35)	ND(2.5)	5.2 J	ND(20)
AP-6136	13FW404WG	6/17/2013	ND(0.60)	1.0 J	200	ND(0.24)	ND(0.12)	1.1 J	0.10 J	ND(1.5)	ND(0.50)	1.6 J	ND(2.0)	ND(0.10)	ND(0.20)	3.9 JH	2.8 J,B
	13FW428WG	9/11/2013	ND(0.60)	0.84 J	209	0.087 J	ND(0.12)	1.2 J	0.072 J	ND(1.5)	ND(0.50)	0.50 J	ND(2.0)	ND(0.10)	ND(0.20)	3.4 J	4.6 J
	14FWOU410WG	10/21/2014	ND(0.40)	ND(1.6)	240	ND(0.40)	ND(0.10)	1.8	0.34 J	1.3 J	0.26 J	1.9 J	ND [1.6]	ND [0.10]	ND(1)	4.6	6.3 J
	15FWOU410WG	4/8/2015	0.72 J	1.4 J	240	ND(1.3)	0.68 J	4.7	0.97 J	ND(7.5)	1.6 J	2.7 J	1.8 J	1.3 J	1.0 J	6.8 J	ND(20)
AP-8061	13FW413WG	6/17/2013	ND(0.60)	8.1	430	ND(0.24)	ND(0.12)	0.89 J	0.21 J	1.2 J	0.20 J	0.67 J	ND(2.0)	ND(0.10)	ND(0.20)	2.8 J	4.5 J,B
	13FW423WG	9/9/2013	ND(6.0)	**12**	570	ND(0.24)	ND(0.12)	1.5 J	0.21 J	1.1	0.41 J	1.5 J	ND(2.0)	ND(0.10)	ND(0.20)	3.7 J	3.3 J
	14FWOU401WG	10/20/2014	ND(0.40)	7.8	520	ND(0.40)	ND(0.10)	1.1	0.24 J	2	0.2 J	1.2 J	ND [1.6]	ND [0.10]	ND(1)	2.4 J	5.1 J
	15FWOU405WG	4/7/2015	ND(1)	8.8	590	ND(1.3)	ND(0.3)	ND(1.5)	ND(0.6)	ND(7.5)	ND(0.5)	ND(5)	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
	15FWOU418WG	11/6/2015	ND(1)	9.6	590	ND(1.3)	ND(0.3)	1.1	ND(0.6)	ND(7.5)	ND(0.5)	ND(5)	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
AP-6138	13FW412WG	6/17/2013	ND(0.60)	1.1 J	420	ND(0.24)	ND(0.12)	1.1 J	0.11 J	ND(1.5)	ND(0.50)	0.34 J	ND(2.0)	ND(0.10)	ND(0.20)	3.8 J	2.2 J,B
	13FW424WG	9/10/2013	ND(0.60)	1.1 J	409	ND(0.24)	ND(0.12)	0.97 J	0.11 J	ND(1.5)	ND(0.50)	1.3 J	ND(2.0)	ND(0.10)	ND(0.20)	3.8 J	ND(6.0)
	14FWOU403WG	10/20/2014	ND(0.40)	2.9	460	ND(0.40)	ND(0.10)	0.41 J	0.41 J	2	6.5	1.9 J	ND [1.6]	ND [0.10]	ND(1)	6.2	7.7 J
	15FWOU403WG	4/7/2015	ND(1)	1.4 J	480	1.30.40)	ND(0.3)	1.1 J	ND(0.6)	ND(7.5)	0.71 J	ND(5)	ND(4)	ND(0.35)	ND(2.5)	5.7 J	35
AP-6532	13FW417WG	6/19/2013	0.43 J	0.99 J	230	ND(0.24)	ND(0.12)	1.7 J	0.19 J	3.3	ND(0.50)	42	ND(2.0)	ND(0.10)	ND(0.20)	4.1 J	21
	13FW435WG	9/17/2013	0.44 J	1.0 J	249	ND(0.24)	ND(0.12)	1.6 J	0.21 J	6.6	ND(0.50)	58	ND(2.0)	ND(0.10)	0.069 J	4.4 J	8.3 J
	14FWOU414WG	10/22/2014	0.31 J	ND(1.6)	250	ND(0.40)	ND(0.10)	1.9	0.15 J	3.2	0.18 J	2.9 J	ND [1.6]	ND [0.10]	ND(1)	4	13
	15FWOU402WG	4/7/2015	0.93 JB	**14**	250	ND(1.3)	ND(0.3)	3.9	0.37 J	6.4 J	1.3 J	8.6 J	ND(4)	ND(0.35)	ND(2.5)	5.7 J	35
	15FWOU424WG	11/9/2015	1	ND(4)	240	ND(1.3)	0.21 J	1.7 J	0.34 J	ND(7.5)	1.6 J	2.4 J	ND(4)	ND(0.35)	ND(2.5)	ND(10)	17 J
AP-8063	13FW406WG	6/17/2013	ND(0.60)	2.8 J	750	ND(0.24)	ND(0.12)	3.8 J	0.69 J	2.9	1.3 J	2.6 J	ND(2.0)	ND(0.10)	ND(0.20)	4.2 J	53
	13FW433WG	9/17/2013	0.57 J	3.1 J	750	ND(0.24)	ND(0.12)	3.8 J	0.76 J	3.4	1.7 J	2.8 J	ND(2.0)	ND(0.10)	ND(0.20)	4.5 J	93
	13FW434WG [0]		0.59 J	3.0 J	749	ND(0.24)	ND(0.12)	4.0 J	0.72 J	2.3	1.7 J	3.1 J	ND(2.0)	ND(0.10)	ND(0.20)	4.4 J	99
	14FWOU407WG	10/20/2014	0.2 J	2.5	730	ND(0.40)	ND(0.10)	2.1	0.22 J	1.2 J	0.48 J	1.5 J	ND [1.6]	ND [0.10]	ND(1)	2.8 J	23
	14FWOU408WG	10/20/2014	0.16 J	2.5	750	ND(0.40)	ND(0.10)	2.1	0.21 J	0.73 J	0.45 J	1.4 J	ND [1.6]	ND [0.10]	ND(1)	2.7 J	23
	15FWOU411WG	4/8/2015	0.63 J	4.3 J	140	ND(1.3)	ND(0.3)	4.6	1.0 J	5.9 J	3.7	3.7 J	ND(4)	ND(0.35)	ND(2.5)	7.9 J	38
	15FWOU412WG[1]		0.55 J	4.2 J	140	ND(1.3)	0.22 J	5.4	0.98 J	5.7 J	3.7	4.2	ND(4)	ND(0.35)	ND(2.5)	8.5 J	41
AP-6530	13FW415WG	6/18/2013	ND(0.60)	2.7 J	390	ND(0.24)	ND(0.12)	0.99 J	0.099 J	ND(1.5)	ND(0.50)	0.34 J	ND(2.0)	ND(0.10)	ND(0.20)	2.7 J	3.2 J,B
	13FW431WG	9/16/2013	0.55 J	3.2 J	419	0.096 J	ND(0.12)	0.96 J	0.15 J	ND(1.5)	ND(0.50)	0.46 J	ND(2.0)	ND(0.10)	0.16 J	2.8 J	3.2 J
	14FWOU405WG	10/20/2014	ND(0.40)	4	380	ND(0.40)	ND(0.10)	1.3	0.095 J	1.4 J	0.4 J	0.89 J	ND [1.6]	ND [0.10]	ND(1)	2.7 J	8
	15FWOU406WG	4/7/2015	ND(1)	4.3 J	330	ND(1.3)	ND(0.3)	ND(1.5)	ND(0.6)	ND(7.5)	ND(0.5)	ND(5)	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
	15FWOU422WG	11/6/2015	ND(1)	4.8 J	320	ND(1.3)	ND(0.3)	0.76 J	ND(0.6)	ND(7.5)	ND(0.5)	ND(5)	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
AP-6535	13FW408WG	6/17/2013	ND(0.60)	2.1 J	250	ND(0.24)	ND(0.12)	1.3 J	0.18 J	3.2	0.42 J	0.45 J	ND(2.0)	ND(0.10)	ND(0.20)	2.4 J	5.3 J,B
	13FW432WG	9/15/2013	ND(0.60)	2.5 J	289	ND(0.24)	ND(0.12)	1.7 J	0.20 J	5.5	0.77 J	0.97 J	ND(2.0)	ND(0.10)	ND(0.20)	3.0 J	9.0 J
	14FWOU412WG	10/21/2014	ND(0.40)	2.8	280	ND(0.40)	ND(0.10)	3	0.27 J	11	1.3	1.2 J	ND [1.6]	ND [0.10]	ND(1)	3.8 J	16
	15FWOU404WG	4/7/2015	0.43 J	2.7	330	ND(1.3)	ND(0.3)	1.8 J	0.2 J	5.6 J	0.87 J	ND(5)	ND(4)	ND(0.35)	ND(2.5)	ND(10)	9.8 J
	15FWOU425WG	11/9/2015	ND(1)	2.4 J	270	ND(1.3)	0.27 J	1.6 J	ND(0.6)	ND(7.5)	0.52 J	ND(5)	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
	15FWOU426WG[1]		ND(1)	2.2 J	270	ND(1.3)	ND(0.3)	1.3 J	ND(0.6)	ND(7.5)	0.39 J	ND(5)	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)
AP-10257	13FW405WG	6/17/2013	0.73 J	3.3 J	270	ND(0.24)	ND(0.12)	1.1 J	8.5	2.2	ND(0.50)	13	ND(2.0)	ND(0.10)	ND(0.20)	2.6 J	38
	13FW429WG	9/11/2013	ND(0.60)	4.0 J	230	ND(0.24)	0.11 J	0.79 J	23	3.7	ND(0.50)	40	ND(2.0)	ND(0.10)	ND(0.20)	2.1 J	40
	14FWOU413WG	10/21/2014	1.7	ND(1.6)	160	ND(0.40)	0.27	1.1	33	11	0.17 J	62	ND [1.6]	ND [0.10]	ND(1)	ND(2)	45
	14FWOU413WG		1.6	ND(1.6)	160	ND(0.40)	0.68J	0.99	32	10	ND [0.1]	60	ND [1.6]	ND [0.10]	ND(1)	ND(2)	43
	15FWOU413WG	4/8/2015	1.3 J	1.5 J	160	ND(1.3)	0.32 J	2.2	22	9.9 J	0.19 J	60	ND(4)	ND(0.35)	ND(2.5)	ND(10)	30 J
	15FWOU414WG[1]		1.1 J	1.6 J	170	ND(1.3)	0.38 J	2	23	8.1 J	ND(0.5)	66	ND(4)	ND(0.35)	ND(2.5)	ND(10)	35
	15FWOU420WG	11/6/2015	1.9 J	ND(4)	200	ND(1.3)	1.1 J	1.2 J	26	15	ND(0.5)	77	ND(4)	ND(0.35)	ND(2.5)	ND(10)	68
	15FWOU421WG[1]		1.8 J	ND(4)	200	ND(1.3)	0.99 J	1 J	26	15	ND(0.5)	75	ND(4)	ND(0.35)	ND(2.5)	ND(10)	68
AP-10258	13FW401WG	6/17/2013	0.62 J	0.65 J	150	ND(0.24)	0.20 J	ND(1.5)	70	1.1 J	ND(0.50)	75	ND(2.0)	ND(0.10)	ND(0.20)	1.2 J	32 B
	13FW402WG [1]		0.70 J	0.57 J	150	ND(0.24)	0.19 J	ND(1.5)	69	0.98 J	ND(0.50)	75	ND(2.0)	ND(0.10)	ND(0.20)	0.99 J	33 B
	13FW421WG	9/10/2013	0.96 J	0.89 J,Q	70	ND(0.24)	0.69 J	0.50 J	77	4.8	ND(0.50)	**170**	ND(2.0)	ND(0.10)	0.058 J,B,Q	1.3 J	72
	13FW422WG [1]		0.96 J	0.57 J,Q	69	ND(0.24)	0.66 J	0.53 J	74	4.2	ND(0.50)	**160**	ND(2.0)	ND(0.10)	0.11 J,B,Q	1.0 J	70
	14FWOU409WG	10/21/2014	0.5 J	ND(1.6)	55	0.43 J	3.3	0.84	190	25	0.12 J	**440**	2.8	ND [0.10]	ND(1)	ND(2)	410
	15FWOU408WG	4/8/2015	1.9 J	ND(4)	63	ND(1.3)	0.98 J	1.4 J	56	9.7 J	ND(0.5)	**210**	ND(4)	ND(0.35)	ND(2.5)	ND(10)	100
	15FWOU419WG	11/6/2015	0.64 J	ND(4)	91	ND(1.3)	1.1 J	ND(1.5)	100	9.3 J	ND(0.5)	**240**	ND(4)	ND(0.35)	ND(2.5)	ND(10)	180
AP-10259	13FW403WG	6/17/2013	ND(0.60)	2.0 J	100	ND(0.24)	0.13 J	ND(1.5)	6.9	1.7 J	ND(0.50)	12	ND(2.0)	ND(0.10)	ND(0.20)	0.62 J	9.8 J,B
	13FW420WG	9/10/2013	0.86 J	0.34 J	76	0.085 J	0.24 J	ND(1.5)	6.3	1.7 J	ND(0.50)	15	ND(2.0)	ND(0.10)	0.17 J,B	ND(1.0)	7.7 J
	14FWOU411WG	10/21/2014	ND(0.40)	ND(1.6)	74	ND(0.40)	ND(0.10)	0.59 J	0.62 J	5.3	0.092 J	20	ND [1.6]	ND [0.10]	ND(1)	ND(2)	11
	15FWOU415WG	4/8/2015	0.48 J	ND(4)	72	ND(1.3)	0.17 J	ND(1.5)	0.35 J	ND(7.5)	ND(0.5)	19	ND(4)	ND(0.35)	ND(2.5)	ND(10)	ND(20)

Notes:

Results in bold denote concentrations above groundwater cleanup levels established in Table C, 18 AAC 75.345 (ADEC, 2012)

[1] Sample is a field duplicate of the sample immediately above.

B - analyte was detected in a blank at a similar concentration and may be due to cross-contamination

J - result qualified as estimate because it is less than the LOQ

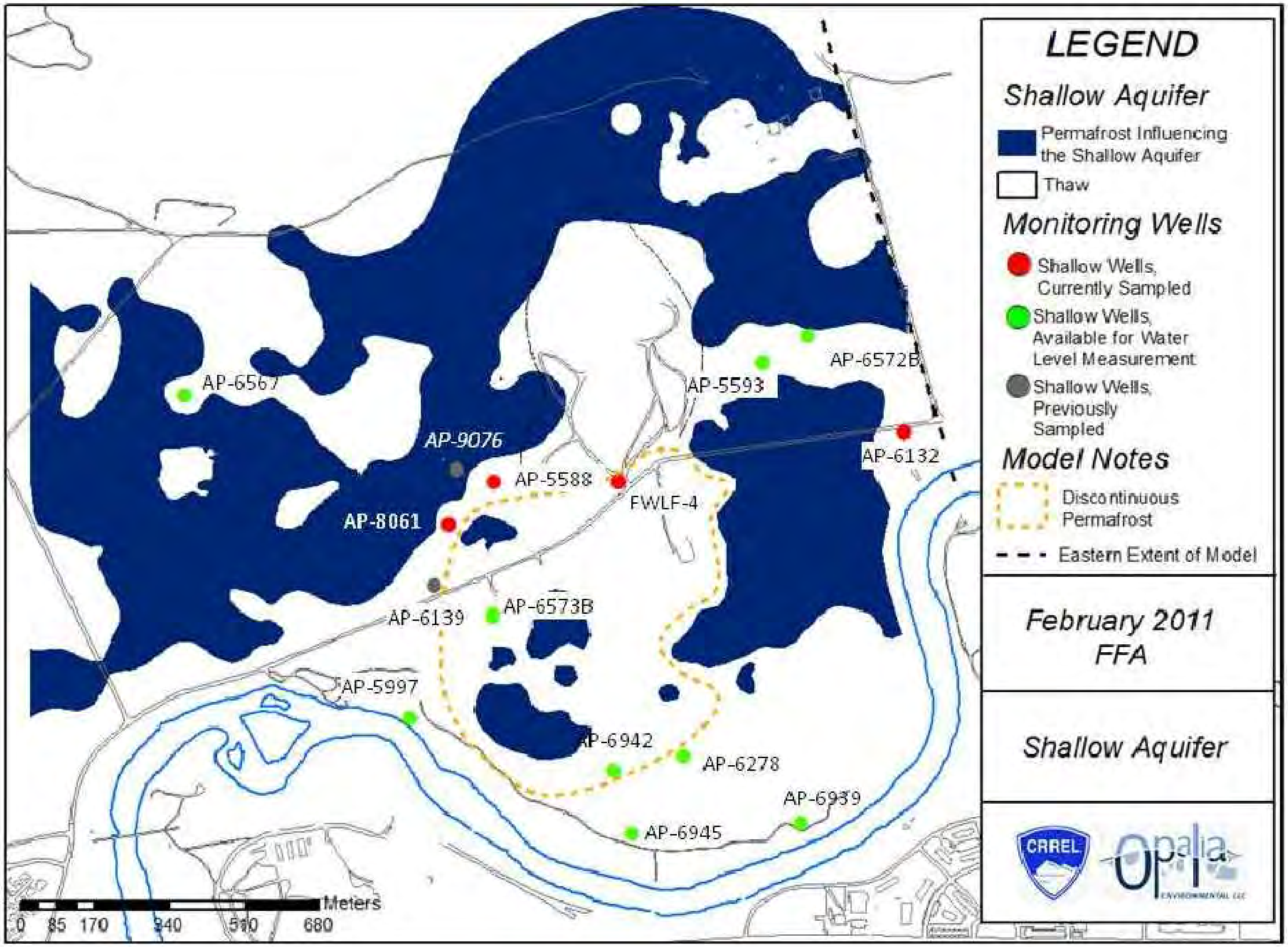
MCL - maximum contaminant level

μg/L - micrograms per liter

NA - not applicable or not analyzed

ND - not detected at the detection limit (LOD in parentheses for 2012 results. LOQ in parentheses for data prior to 2012.)

Q - result considered an estimate (L-low; H-high) due to a quality control failure



SOURCE:

CRREL AND OPALIA ENVIRONMENTAL INC, FFA MEETING FEBRUARY 2011

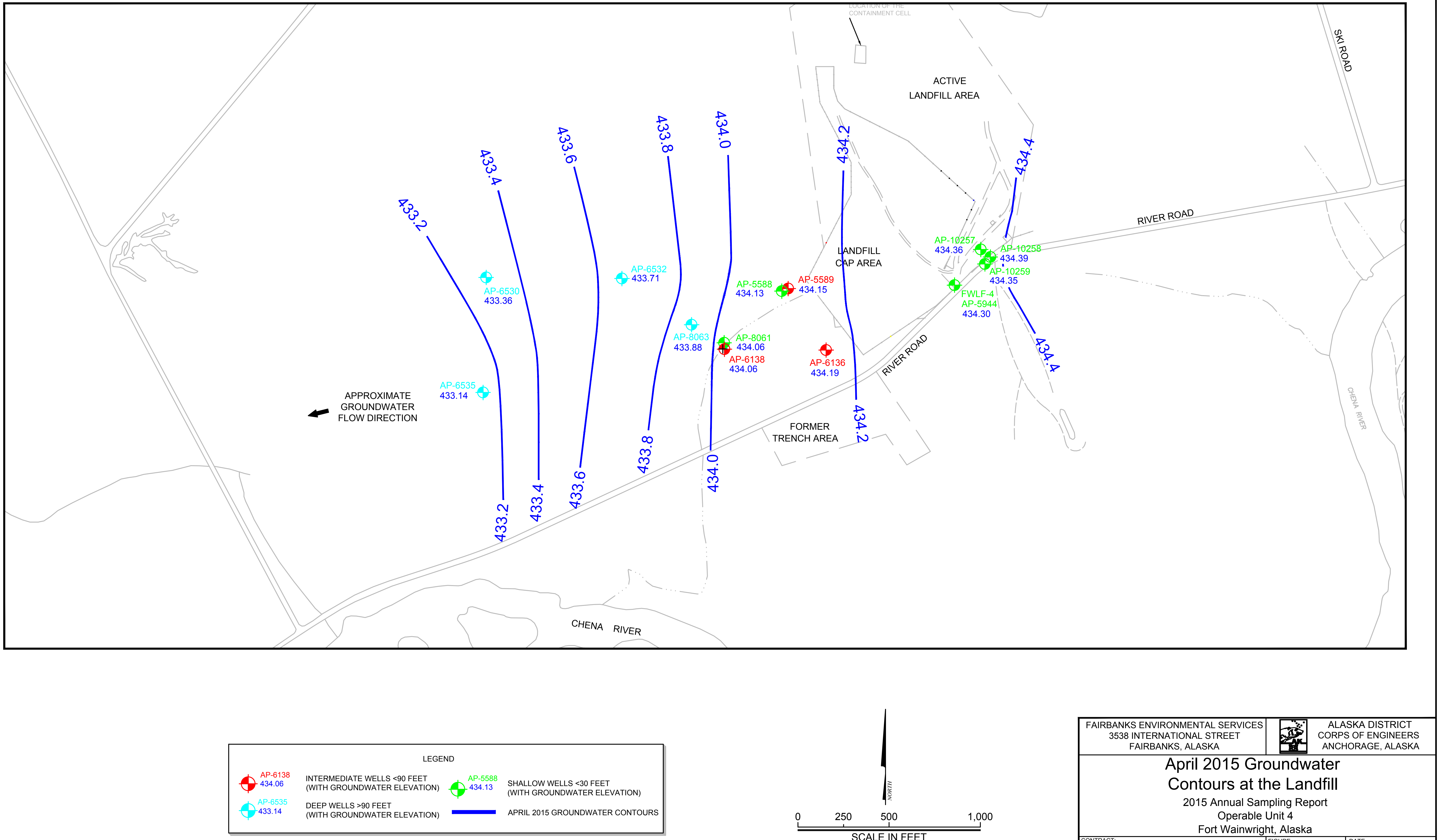
FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Permafrost Distribution at the Landfill Source Area

2015 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	3-1	1/17



FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

April 2015 Groundwater Contours at the Landfill

2015 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001
FIGURE: 3-2
DATE: 1/17

WELL AP-5589
Top of PVC 452.30
Total Well Depth (ft) 56.2

	JUL 97	DEC 98	MAR 99	JUN 99	AUG 99	MAR 00	AUG 00	MAR 01	SEP 01	JUN 02	OCT 02	MAY 03	SEP 03	JUN 04	OCT 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15
Groundwater Elevation (feet)	420.63	428.84	427.82	428.64	429.19	428.07	429.37	433.99	434.64	435.56	436.03	434.45	437.85	435.73	433.41	435.63	434.73	434.99	434.59	434.07	434.40	435.35	436.23	434.72	434.70	433.82	433.83	436.56	434.98	434.38	435.93	434.23	435.78	434.15
Benzene	4.00	4.03	4.00	4.01	4.28	3.87	3.86	4.10	4.10	3.54	3.32	3.47	4.25	3.95	3.38	3.58	3.43	3.98	3.40	3.20	2.54	3.30	3.60	3.00	3.40	2.80	3.50	3.3	3.1	2.6	3.0	2.4	3.3	3.3
cis-1,2-Dichloroethene	13.0	9.83	9.00	10.7	11.1	9.44	8.58	9.00	14.0	7.37	8.19	8.39	9.28	10.2	11.0	10.9	10.5	12.0	14.0	11.1	13.4	14.0	15.0	13.0	14.0	13.0	17	18	19	16	16	14	16	14
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	2.00	1.16	ND(1.0)	ND(1.0)	ND(1.0)	1.30	ND(5.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.40	2.08	0.67	8.42	6.34	5.60	24.5	ND(0.5)	0.23	0.22	0.63	5.6	4.9	ND(1.0)	ND(1.0)	ND(1.0)	0.31	ND(0.4)	ND(0.4)	1.5	2.0
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.094 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
Trichloroethene	4.00	3.47	4.00	3.73	3.96	3.74	3.52	3.90	4.50	3.05	3.49	3.01	3.19	3.42	3.95	3.01	3.33	3.84	3.90	5.04	3.83	3.10	3.80	3.90	5.10	4.10	4.90	4.4	4.4	4.5	4.5	3.6	4.9	4.6
Vinyl Chloride	ND(1.0)	1.19	ND(1.0)	1.24	1.44	1.50	1.40	1.70	2.60	ND(1.0)	1.41	1.33	1.07	1.64	2.10	1.39	1.55	2.64	1.20	1.32	1.61	1.10	1.10	ND(1.0)	1.00	ND(1.0)	0.97	1.2	0.85	0.66	0.60	0.71	0.88	1.1
bis (2-ethylhexyl)phthalate	1.00	ND(11)	9.30	NA	ND(11)	ND(10)	ND(10)	2.80	ND(5.0)	ND(20)	ND(20)	R	ND(16)	ND(9.3)	ND(10)	ND(10)	ND(10)	ND(10)	ND(16)	ND (10.4)	ND (10.7)	4.00	ND(15)	ND(15)	ND(9.6)	ND(9.6)	1.6	0.79	ND(5.2)	0.97	23	ND(0.2)	ND(0.3)	ND(1.9)
Methane																									6,200	2,400	1,400	2,700	2,800	5,300	1,700	4,200	4,100	3,400

WELL AP-5588
Top of PVC 451.28
Total Well Depth (ft) 29.03

	JUL 97	DEC 98	MAR 99	JUN 99	AUG 99	MAR 00	AUG 00	MAR 01	SEP 01	JUN 02	OCT 02	MAY 03	SEP 03	JUN 04	OCT 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07*	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15
Groundwater Elevation (feet)	430.90	428.32	427.80	428.72	429.31	428.12	429.45	434.03	434.66	435.70	435.9	434.42	436.37	435.15	432.64	435.61	434.97	434.98	434.57	434.11	434.36	435.31	436.20	434.73	434.63	433.82	433.83	436.56	434.96	434.50	435.92	434.20	435.75	434.13
Benzene	2.00	2.27	2.00	2.42	3.07	2.26	2.29	2.50	2.10	1.64	2.37	1.93	ND (4.0)	2.25	2.09	2.49	2.42	2.52	2.10	1.12	0.34	2.60	2.30	2.20	ND(50)	2.20	ND(50)	2.6	1.9	2.0	1.4	1.5	0.76	1.8
cis-1,2-Dichloroethene	160	170	190	184	176	173	168	160	220	117	127	162	121	183	168	133	160	169	200	ND(25)	148	150	150	170	190	180	190	140	130	120	110	110	120	180
1,1,2,2-Tetrachloroethane	1,700	2,020	2,400	1,920	1,570	2,130	2,180	2,000	1,300	934	1,260	1,990	1,820	2,590	2,990	1,600	2,820	2,870	2,600	378	2,840	1,200	1,600	2,300	2,600	2,800	2,400	890	950	830	940	980	1,400	1,300
1,1,2-Trichloroethane	8.00	10.2	11.0	9.92	9.41	10.1	9.71	10.0	7.70	5.46	7.10	9.52	9.53	11.8	13.2	7.58	12.4	13.8	13	13.9	10.4	6.00	7.40	9.20	ND(50)	73	ND(50)	5.2	5.7	6.2	4.7	4.2	5.4	10
Trichloroethene	280	196	320	243	252	271	257	440	240	168	193	248	203	314	295	205	279	305	320	31.0	290	170	180	310	310	260	360	170	190	170	130	140	190	320
Vinyl Chloride	ND(1.0)	ND(1.0)	ND(1.0)	1.11	1.37	1.17	1.31	1.10	1.30	ND(1.0)	1.33	0.88	ND(10)	1.21	1.45	1.49	1.52	2.42	ND(10)	1.42	1.06	1.30	1.10	1.20	ND(50)	0.51	ND(50)	1.5	1.0	ND(0.4)	0.51	0.96	0.4	0.87
bis (2-ethylhexyl)phthalate	ND(11)	ND(11)	0.60	NA	ND(11)	ND(10)	ND(11)	3.40	ND(5.1)	ND(21)	ND(20)	7.30	ND(16)	ND(9.3)	ND(10)	ND(10)	ND(10)	ND(9.7)	ND(17)	ND(3.23)	ND(11.8)	7.20	0.74	ND(0.15)	ND(9.6)	0.63	ND(4.8)	0.53	ND(5)	1.1	0.69	ND(0.27)	ND(3)	1.2
Methane																									3,800	1,200	1,100	2,200	1,100	1,700	1,100	1,700	1,400	1,800

WELL AP-6854A
Top of PVC 450.06
Total Well Depth (ft) 64.8

	OCT 10
Groundwater Elevation (feet)	434.26
Benzene	0.45
cis-1,2-Dichloroethene	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)
Trichloroethene	ND(1.0)
Vinyl Chloride	0.95
bis (2-ethylhexyl)phthalate	ND(4.8)
Methane	14,000

WELL AP-6854
Top of PVC 449.17
Total Well Depth (ft) 100

	OCT 10
Groundwater Elevation (feet)	434.27
Benzene	0.44
cis-1,2-Dichloroethene	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)
Trichloroethene	ND(1.0)
Vinyl Chloride	ND(1.0)
bis (2-ethylhexyl)phthalate	ND(4.8)
Methane	14,000

WELL FWLF-4
Top of PVC 452.26
Total Well Depth (ft) 25.1

	DEC 98	MAR 99	JUN 99	AUG 99	MAR 00	AUG 00	MAR 01	SEP 01	JUN 02	OCT 02	MAY 03	SEP 03	JUN 04	OCT 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15
Groundwater Elevation (feet)	429.35	428.27	429.25	429.60	428.50	429.95	433.89	434.64	435.54	435.87	434.91	437.13	436.20	433.39	435.17	434.97	435.04	434.63	434.00	434.47	435.36	436.48	434.66	434.74	433.82	434.0	436.67	435.02	429.53	436.07	434.40	437.07	434.30
Benzene	1.97	2.00	1.67	1.58	1.53	1.31	1.40	1.40	0.91	1.26	1.32	1.34	1.43	1.80	1.87	1.57	1.49	1.50	1.27	ND(0.4)	1.10	0.90	1.2	1.4	1.2	1.1	0.94	0.84	0.51	0.52	0.4	1.2	0.88
cis-1,2-Dichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.41	0.36	0.41	0.36	0.44	0.50	ND(1.0)	0.45	0.52	ND(1.0)	0.95	0.41	0.38	0.40	0.47	ND(1.0)	0.50	0.36	0.37	0.31	0.26	0.19	0.47	0.29
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
Trichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(1)
Vinyl Chloride	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
bis (2-ethylhexyl)phthalate	15.3	2.20	NA	ND(11)	ND(10)	ND(10)	ND(5.0)	4.30	ND(22)	ND(22)	6.7	ND(16)	ND(9.3)	ND(10)	ND(10)	ND(10)	ND(9.7)	ND(16)	ND(10.8)	ND(11.1)	1.80	ND(15)	ND(15)	ND(9.6)	5.4	ND(4.8)	0.49	0.37	1.1	0.66	0.8	13	9.5
Methane																								120	29	36	110	70	120	120	220	190	120

WELL AP-6132
Top of PVC 456.06
Total Well Depth (ft) 23.7

	AUG 99	MAR 00	AUG 00	MAR 01	SEP 01	JUN 02	OCT 02	MAY 03	SEP 03	JUN 04	OCT 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10
Groundwater Elevation (feet)	429.97	429.80	430.85	435.75	436.13	436.77	438.29	435.91	439.08	436.97	434.11	436.6	436.58	435.75	435.61	435.04	435.39	435.87	438.84	435.45	435.42	434.35	434.76
Benzene	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(0.5)	ND(0.5)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.4)	ND(1.0)	ND(0.4)	ND(0.4)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
cis-1,2-Dichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	0.96	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Trichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.89	ND(1.0)	ND(1.0)	0.31	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Vinyl Chloride	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
bis (2-ethylhexyl)phthalate	ND(11)	ND(9.9)	ND(10)	2.10	1.50	ND(22)	ND(20)	5.90	ND(17)	ND(9.3)	ND(10)	ND(10)	ND(10)	ND(9.8)	ND(16)	ND(10.5)	ND(11.6)	2.50	0.34	ND(1.0)	ND(9.5)	3.2	1.2
Methane																					130	32	99

WELL AP-10257
Top of PVC 454.01
Total Well Depth (ft) 24.45

	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15	NOV 15
Groundwater Elevation (feet)	434.51	436.22	434.40	436.31	434.36	436.76
Benzene	14	3.4	17	6.6	14	7.4
cis-1,2-Dichloroethene	3.9	1.6	3.9	2.0	3.3	3.1
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(1)	ND(1)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
bis (2-ethylhexyl)phthalate	1.1	1.1	1.1	ND(2.0)	4.1	ND(2.1)
Methane	1,400	46	1,200	300	2,500	2,700

WELL AP-10258
Top of PVC 453.54
Total Well Depth (ft) 18.90

	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15	NOV 15
Groundwater Elevation (feet)	434.64	436.22	434.42	436.29	434.39	436.77
Benzene	ND(0.2)	0.40	2.7	5.7	4.9	3.4
cis-1,2-Dichloroethene	0.45	0.39	1.7	2.5	3.5	2.9
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(1)	ND(1)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
bis (2-ethylhexyl)phthalate	0.98	0.76	ND(0.26)	ND(2.9)	ND(1.9)	ND(2.0)
Methane	15	44	160	280	480	680

WELL AP-10259
Top of PVC 453.95
Total Well Depth (ft) 19.20

	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15
Groundwater Elevation (feet)	434.75	436.31	434.44	436.57	434.35
Benzene	0.72	0.7	0.18	ND(0.4)	ND(1)
cis-1,2-Dichloroethene	0.45	0.37	ND(0.2)	ND(0.4)	ND(0.5)
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(1)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
bis (2-ethylhexyl)phthalate	0.97	1.3	ND(0.26)	ND(2.0)	ND(1.9)
Methane	27	50	17	0.25	ND(0.37)

WELL AP-6527
Top of PVC UNKNOWN
Total Well Depth (ft) 180.35

	AUG 11	NOV 12
Groundwater Elevation (feet)	UNKNOWN	UNKNOWN
Benzene	1.2	1.5
cis-1,2-Dichloroethene	ND(1.0)	ND(2)
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(0.4)
1,1,2-Trichloroethane	ND(1.0)	ND(0.4)
Trichloroethene	ND(1.0)	ND(2)
Vinyl Chloride	ND(1.5)	ND(0.8)
bis (2-ethylhexyl)phthalate	ND(300)	13
Methane	1.9	10

WELL AP-6530
Top of PVC 450.06
Total Well Depth (ft) 142.2

	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15	NOV 15
Groundwater Elevation (feet)	432.96	435.43	434.08	434.26	434.84	434.24	434.81	433.36	436.04
Benzene	0.69	5.7	4.2	2.5	5.8	5.0	3.2	3.0	1.9
cis-1,2-Dichloroethene	ND(1.0)	1.6	0.90	0.54	1.8	1.6	0.42	0.62	0.26
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	0.89	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
Trichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(1)	ND(1)
Vinyl Chloride	ND(1.0)	ND(1.5)	ND(1.5)	ND(0.8)	0.31	0.27	ND(0.4)	ND(0.5)	ND(0.5)
bis (2-ethylhexyl)phthalate	ND(52)	0.43	0.50	1.1	1.3	1.1	27	ND(2.2)	3.5
Methane	290	2,100	1,400	570	2,800	3,900	530	330	120

WELL AP-6534
Top of PVC 450.15
Total Well Depth (ft) 198.4

	OCT 10	JULY 11
Groundwater Elevation (feet)	433.42	435.57
Benzene	1.9	1.2
cis-1,2-Dichloroethene	ND(1.0)	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)
Trichloroethene	ND(1.0)	ND(1.0)
Vinyl Chloride	ND(1.0)	ND(1.5)
bis (2-ethylhexyl)phthalate	ND (5.2)	0.61
Methane	140	150

WELL AP-6535
Top of PVC 448.09
Total Well Depth (ft) 93.1

	OCT 10	JULY 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15	NOV 15
Groundwater Elevation (feet)	431.7	435.09	434.04	434.70	434.10	434.39	433.14	435.74
Benzene	3.6	3.4	3.1	3.3	2.1	3.3	3.0	3.4
cis-1,2-Dichloroethene	33	34	31	33	22	34	31	33
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
Trichloroethene	0.65	0.57	0.58	0.95	0.33	0.73	0.55	0.60
Vinyl Chloride	0.9	1.1	1.0	0.86	0.66	1.1	1.0	ND(0.5)
bis (2-ethylhexyl)phthalate	1.4	0.49	1.6	1.1	0.95	2.3	ND(2.3)	ND(2.1)
Methane	1,000	810	1,600	1,100	2,100	1,800	1,100	1,600

WELL AP-6136
Top of PVC 454.14
Total Well Depth (ft) 96.1

	JUL 97	DEC 98	MAR 99	JUN 99	AUG 99	MAR 00	AUG 00	MAR 01	SEP 01	JUN 02	OCT 02	MAY 03	SEP 03	JUN 04	OCT 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15
Groundwater Elevation (feet)	428.08	428.93	427.84	427.84	429.11	428.13	429.43	434.01	434.71	435.59	435.99	434.50	436.98	436.00	429.65	435.61	435.04	435.07	434.68	434.11	434.45	435.54	436.29	434.84	434.83	433.90	433.91	436.61	434.82	434.61	436.02	434.02	435.68	434.19
Benzene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(0.5)	0.42	0.28	0.26	0.34	0.43	ND(0.4)	ND(0.4)	0.35	0.32	0.26	ND(0.4)	0.19	0.27	0.43	0.35	0.29	0.35	ND(1.0)	0.29	0.21	0.16	0.21	0.53	0.74
cis-1,2-Dichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.091	0.10	ND(1.0)	0.11	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.5)
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	0.55	ND(0.5)	ND(1.0)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
Trichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(1)
Vinyl Chloride	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
bis (2-ethylhexyl)phthalate	22 .0	24.8	13.0	NA	32.3	36.8	ND(10)	33.0	ND(5.0)	ND(22)	ND(22)	5.30	ND(17)	4.20	13.0	8.90	ND(10)	ND(9.9)	0.43	ND(10.5)	ND (10.9)	2.40	ND(15)	ND(15)	1.2	2.6	2.6	0.32	0.32	1.1	NA	0.96	6.8	ND(2.2)
Methane																									110	51	28	140	130	160	160	210	130	110

WELL AP-8061
Top of PVC 444.30
Total Well Depth (ft) 25.2

	SEP 01	JUN 02	SEP 02	MAY 03	SEP 03	JUN 04	OCT 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15	NOV 15
Groundwater Elevation (feet)	434.57	435.44	435.84	434.33	436.61	435.76	433.29	435.53	434.88	434.94	434.48	433.91	434.28	435.28	436.10	434.63	434.57	433.73	433.71	436.39	434.83	434.45	435.78	434.13	435.53	434.06	436.32
Benzene	5.00	2.46	4.84	3.39	5.80	3.34	5.77	3.09	5.07	5.74	5.50	5.08	5.00	4.40	5.5	4.40	5.2	4.7	5.8	5.3	4.8	4.3	2.9	3.9	3.9	3.9	5.4
cis-1,2-Dichloroethene	31.0	15.6	26.5	20.6	28.8	22.9	22.4	17.7	18.9	24.3	20.0	20.9	16.0	17.0	20.0	18.0	14.0	10	13	11	12	9	8.6	7.3	13	8.9	9.7
1,1,2,2-Tetrachloroethane	ND(2.0)	1.50	3.85	2.92	3.05	1.05	ND(0.5)	ND(0.5)	ND(0.5)	0.24	ND(1.0)	ND(0.5)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	1.9	ND(1.0)	ND(1.0)	ND(1.0)	0.71	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
Trichloroethene	11.0	7.86	12.9	11.0	13.0	12.3	12.3	8.74	9.20	12.7	9.60	12.7	8.11	6.8	7.6	8.9	6.6	4.8	6.2	5.8	5.9	4.6	4.4	3.8	7.8	4.5	7.0
Vinyl Chloride	ND(2.0)	ND(1.0)	ND(1.0)	0.33	0.47	0.53	0.65	0.43	0.59	1.25	0.49	ND(1.0)	0.66	0.40	0.56	ND(1.0)	0.30	ND(1.0)	0.24	ND(1.5)	ND(1.5)	ND(0.8)	0.13	0.15	ND(0.4)	ND(0.5)	ND(0.5)
bis (2-ethylhexyl)phthalate	ND(5.0)	ND(22)	ND(23)	6.00	ND(17)	5.00	ND(10)	ND(10)	ND(11)	ND(9.5)	ND(16)	ND(10.4)	ND(10.5)	4.00	ND(15)	ND(15)	ND(9.7)	ND(15)	1.3	0.3	ND(5.1)	0.92	0.79	0.81	ND(1.9)	ND(1.9)	ND(2.1)
Methane																	960	280	610	460	670	880	260	600	560	440	630

WELL AP-6532
Top of PVC 451.38
Total Well Depth (ft) 177.2

	JUL 97	DEC 98	MAR 99	JUN 99	AUG 99	MAR 00	AUG 00	MAR 01	SEP 01	JUN 02	SEP 02	MAY 03	SEP 03	JUN 04	NOV 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15	NOV 15
Groundwater Elevation (feet)	*	428.08	426.35	428.11	428.73	426.98	428.83	432.57	433.02	432.83	434.43	433.92	436.37	433.23	432.25	434.13	433.32	434.58	434.11	432.51	433.12	435.06	435.49	434.68	434.23	433.47	433.42	435.67	434.38	434.47	435.02	434.47	435.03	433.71	436.25
Benzene	2.00	1.79	2.00	1.77	1.52	1.81	1.80	2.40	2.00	1.64	2.17	1.75	2.00	8.09	0.86	8.43	8.30	9.62	8.80	9.35	7.96	9.60	10.0	3.40	1.00	11.0	12.0	11.0	10.0	2.4	11.0	9.2	13	11	11
cis-1,2-Dichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	3.82	ND(1.0)	3.82	3.74	3.74	4.10	3.21	2.74	3.30	3.70	11.0	0.62	3.4	3.4	3.3	2.8	0.66	2.3	2.4	2.4	2.4	2.8
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)
Trichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.95	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(1)	ND(1)
Vinyl Chloride	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.31	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	0.25
bis (2-ethylhexyl)phthalate	6.00	ND(12)	8.90	NA	29.1	75.0	ND(10)	ND(5.1)	ND(5.7)	ND(22)	ND(23)	6.80	ND(17)	ND(10)	ND(10)	ND(10)	ND(10)	ND(9.6)	0.47	ND(11.2)	ND(10.6)	0.82	ND(15)	ND(15)	7.8	ND(9.6)	1.4	0.74	0.33	1.2	1.1	1.6	ND(2.9)	20	19
Methane																									1,400	5,300	5,200	5,300	5,300	1,500	2,200	5,900	4,300	3,600	1,500

* NO ELEVATION GIVEN FOR TOP OF CASING.

WELL AP-8063
Top of PVC 451.36
Total Well Depth (ft) 120.55

	SEP 01	JUN 02	OCT 02	JUN 03	SEP 03	JUN 04	NOV 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15
Groundwater Elevation (feet)	434.34	NS	435.03	434.21	436.79	434.56	433.17	435.85	434.59	434.65	434.44	433.75	434.36	435.18	435.77	434.68	434.36	433.64	433.59	435.91	434.60	434.70	435.60	434.65	435.34	433.88
Benzene	4.50	NS	3.39	3.44	3.46	3.01	0.73	2.65	3.46	3.56	2.80	2.92	2.65	2.60	2.90	2.30	0.15	2.80	3.0	2.6	2.7	2.5	2.5	2.0	2.6	ND(1)
cis-1,2-Dichloroethene	72.0	NS	43.5	74.8	70.5	69.6	5.10	46.6	87.7	82.5	82.0	58.8	57.1	94.0	91.0	75.0	6.00	110	110	87	91	110	93	83	120	4.6
1,1,2,2-Tetrachloroethane	51.0	NS	49.6	33.6	77.4	9.60	0.94	11.3	1.59	3.06	1.60	1.26	2.95	11.0	11.0	20.0	0.99	29.0	37.0	61	49	43	46	43	39	ND(0.5)
1,1,2-Trichloroethane	0.85	NS	0.84	0.64	0.97	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(10)	ND(1.0)	ND(1.0)	0.36	0.50	0.28	ND(1.0)	0.66	0.83	0.89	0.94	0.92	0.95	1	0.79	ND(0.5)
Trichloroethene	24.0	NS	16.5	22.5	28.2	17.3	1.23	16.7	21.6	22.9	18.0	22.0	21.0	17.0	16.0	15.0	1.10	21.0	24.0	23.0	24.0	26.0	25.0	21.0	29	0.78
Vinyl Chloride	2.10	NS	1.10	1.48	1.91	1.58	ND(1.0)	1.30	1.64	2.22	ND(10)	1.76	2.08	1.50	1.40	1.10	ND(1.0)	0.76	1.2	1.3	1.2	1.2	0.98	0.82	1.3	ND(0.5)
bis (2-ethylhexyl)phthalate	ND(5.3)	NS	ND(20)	41.0	ND(16)	ND(10)	ND(10)	ND(10)	11.0	7.40	ND(17)	ND(10.5)	ND(10.9)	0.39	ND(15)	ND(15)	3.8	1.1	ND(5.2)	0.77	15	1.2	2.0	2.5	ND(2.9)	5.7
Methane																	440	3,000	1,300	2,900	3,400	4,600	2,800	4,700	3,100	2,100

NS = NO SAMPLE COLLECTED BECAUSE WELL WAS FROZEN DURING SAMPLING EVENT.

WELL AP-6138
Top of PVC 444.92
Total Well Depth (ft) 85.91

	JUL 97	DEC 98	MAR 99	JUN 99	AUG 99	MAR 00	AUG 00	MAR 01	SEP 01	JUN 02	SEP 02	MAY 03	SEP 03	JUN 04	NOV 04	MAY 05	OCT 05	JUNE 06	OCT 06	MAY 07	OCT 07	MAY 08	SEPT 08	JUNE 09	NOV 09	MAY 10	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15
Groundwater Elevation (feet)	428.10	*	427.62	428.70	428.45	427.91	429.10	NS	437.39	438.24	438.68	434.37	NE	435.96	433.52	435.77	435.15	435.02	434.62	434.17	434.48	435.19	436.12	434.65	434.56	433.72	433.68	436.39	434.81	434.53	435.75	434.14	435.50	434.06
Benzene	3.00	3.07	3.00	3.28	2.83	3.53	2.82	NS	2.00	3.29	2.86	3.15	3.04	4.14	4.24	3.90	3.66	3.80	3.70	3.71	2.22	3.10	3.30	2.90	3.30	3.40	4.70	2.9	3.0	2.8	2.8	2.23	2.5	3.2
cis-1,2-Dichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(0.5)	0.36	ND(1.0)	0.59	0.45	0.44	0.57	ND(1.0)	0.34	0.36	ND(1.0)	0.96	0.36	0.41	0.24	0.44	0.55	0.52	0.37	0.36	0.39	0.39	0.25	0.38	0.53
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	0.95	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	1.5	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	0.75	ND(0.5)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
Trichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.47	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.42	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(1)
Vinyl Chloride	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)
bis (2-ethylhexyl)phthalate	1.00	35.5	3.10	NA	19.1	ND(10)	ND(10)	NS	ND(5.3)	ND(22)	ND(22)	5.6	ND(16)	ND(9.4)	ND(10)	ND(11)	ND(11)	ND(10)	11.0	ND (11.5)	ND(10.8)	2.10	ND(15)	ND(15)	ND(9.6)	ND(9.6)	2.4	ND(4.8)	0.67	0.82	0.76	ND(0.2)	ND(2.9)	ND(1.9)
Methane																									160	56	110	89	88	170	91	160	160	190

* MEASUREMENT NOT TAKEN.
NS = WELL NOT SAMPLED, WELL STRUCTURE COMPR0MISED.
NE = REPLACE TOP 10 FEET OF PVC WITH STAINLESS STEEL CASING, THEREFORE CHANGING TOC ELEVATION.

WELL AP-5997
Top of PVC Unknown
Total Well Depth (ft) 25.8

	JULY 11
Groundwater Elevation (feet)	UNKNOWN
Benzene	ND(1.0)
cis-1,2-Dichloroethene	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)
Trichloroethene	ND(1.0)
Vinyl Chloride	ND(1.0)
bis (2-ethylhexyl)phthalate	0.35
Methane	7.4

LEGEND

AP-6138 ⊕	MONITORING WELL
═══	PRIMARY ROAD
— —	SECONDARY ROAD
——	BOUNDARY
—··—	DRAINAGE
– – –	TRAIL
ND	INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANITATION LIMIT IS STATED IN PARENTHESES.

RAOs IN µg/L

5	Benzene
70	cis-1,2-Dichloroethene
5.2	1,1,2,2-Tetrachloroethane
5	1,1,2-Trichloroethane
5	Trichloroethene
2	Vinyl Chloride
6	bis (2-ethylhexyl)phthalate
NA	Methane

KEY:

MONITORING WELL

WELL AP-8063
TOP OF PVC 451.13
Total Well Depth (ft) 121.3

	SEP 01	JUN 02	OCT 02	JUN 03	SEP 03	JUN 04
Groundwater Elevation (feet)	434.34	NS	435.03	434.21	436.79	436.79
Benzene	4.5	NS	3.39	3.44	3.46	3.01
cis-1,2-Dichloroethene	72	NS	43.5	74.8	70.5	69.6
1,1,2,2-Tetrachloroethane	51	NS	49.6	33.6	77.4	9.60
1,1,2-Trichloroethane	0.85 J	NS	0.84 J	0.64 J	0.97 J	ND(1.0)
Trichloroethene	24	NS	16.5	22.5	28.2	17.3
Vinyl Chloride	2.1	NS	1.1	1.48	1.91 J	1.58
bis (2-ethylhexyl)phthalate	ND (5.3)	NS	ND(20)	41 B	ND(16)	ND(10)

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)

NS = NO SAMPLE COLLECTED BECAUSE WELL WAS FROZEN DURING SAMPLING EVENT.

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Concentrations of Analytes in Groundwater at the Landfill Source Area

2015 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001
FIGURE: 3-3
DATE: 1/17

Figure 3-4   Historical Contaminant Concentrations in AP-5588

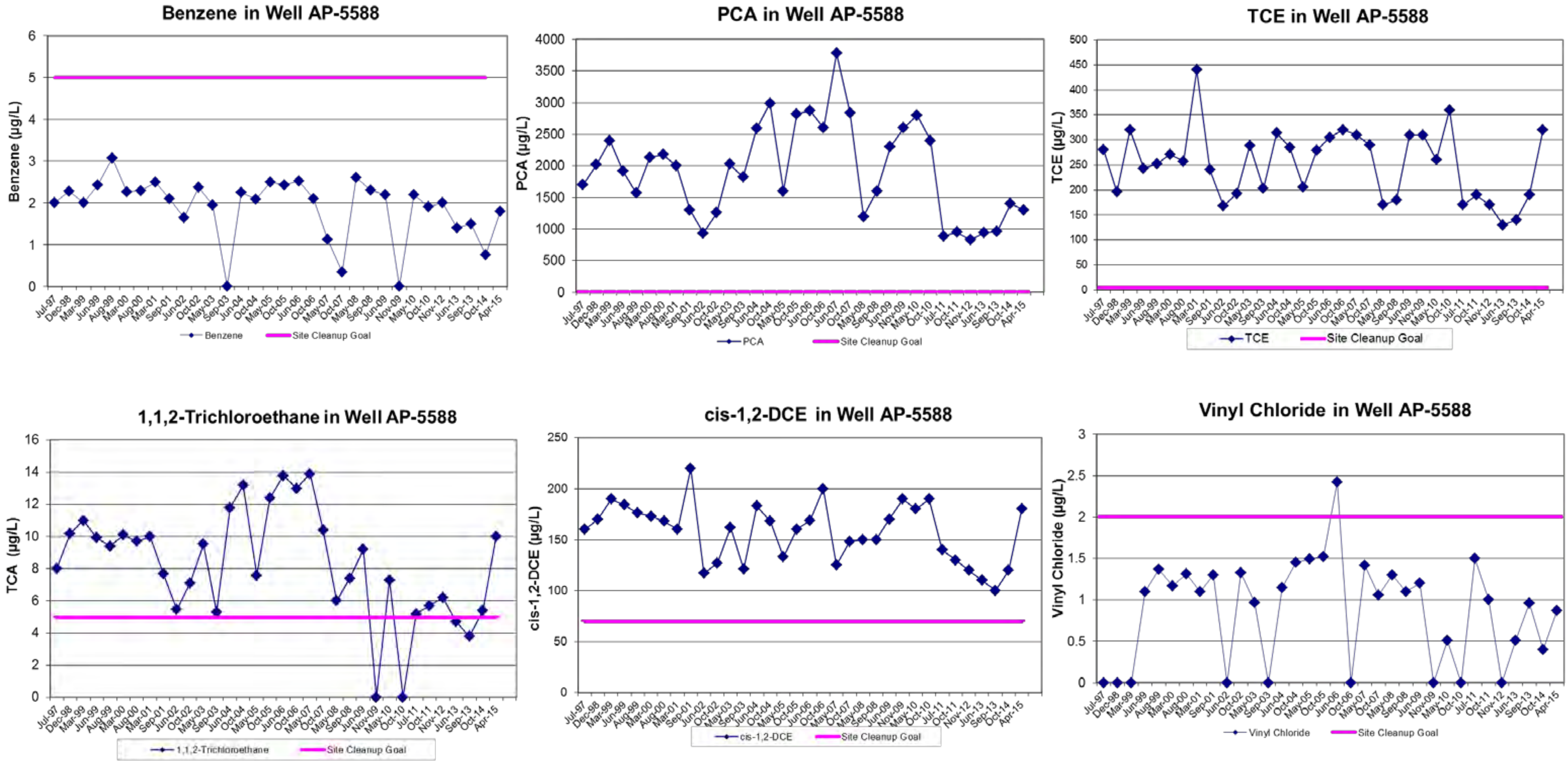
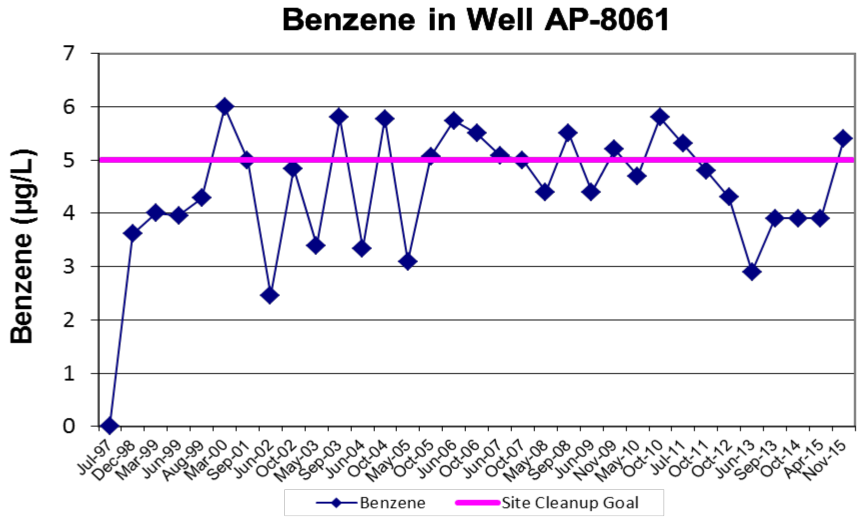
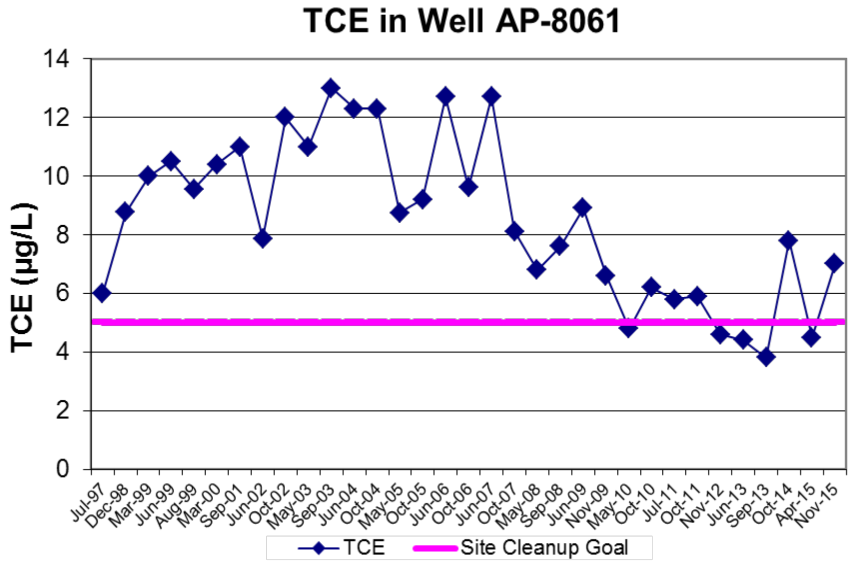


Figure 3-5 Historical Contaminant Concentrations in AP-8061





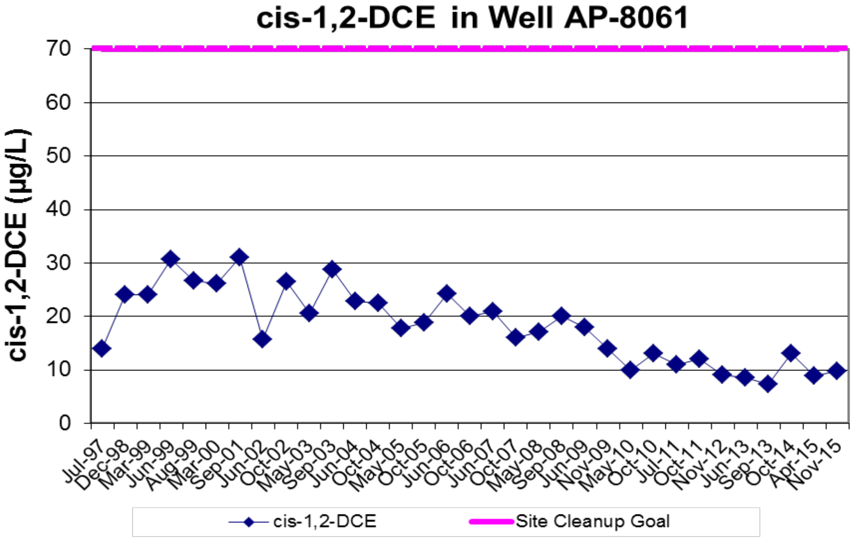


Figure 3-6 Historical Contaminant Concentrations in AP-5589

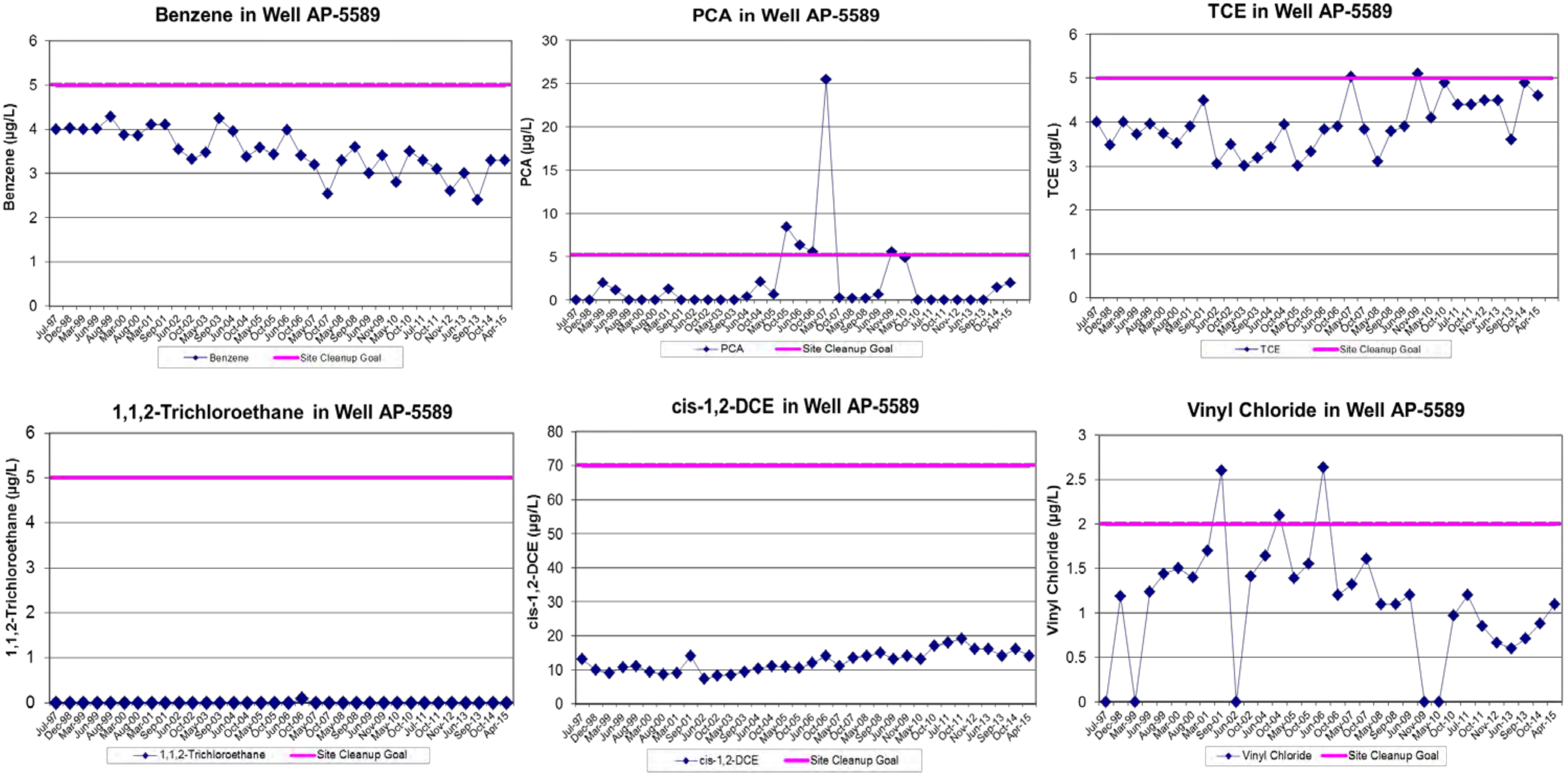


Figure 3-7   Historical Contaminant Concentrations in AP-8063

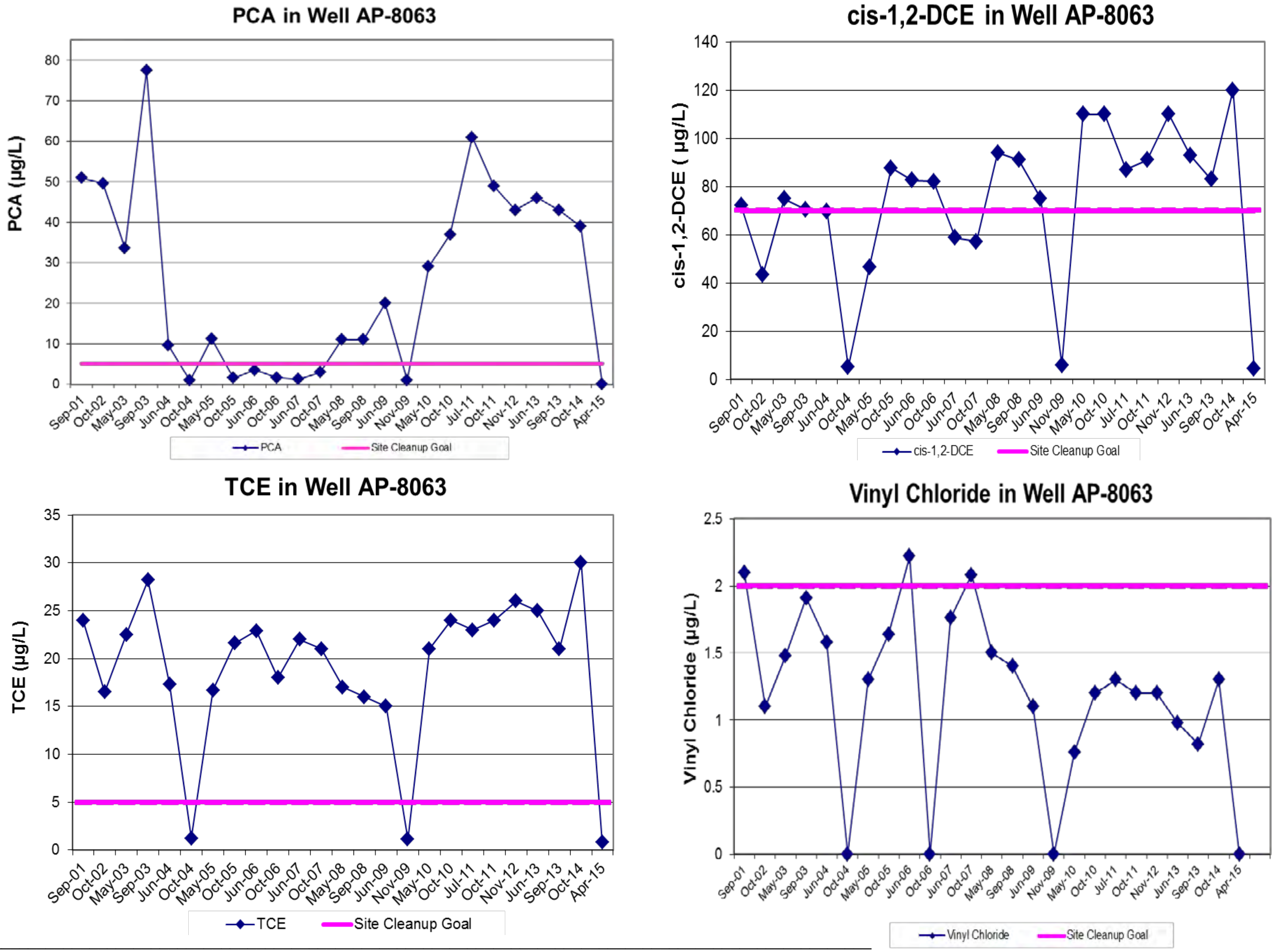


Figure 3-8 Historical Benzene Concentrations in AP-6532 (formerly identified as DH-6534)

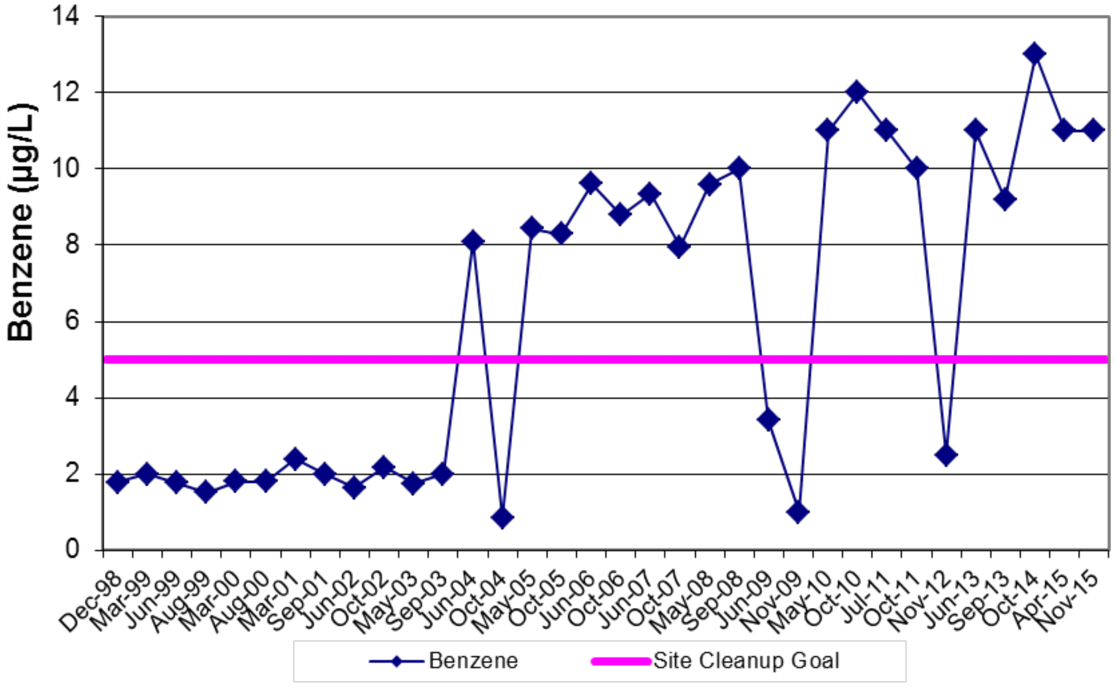
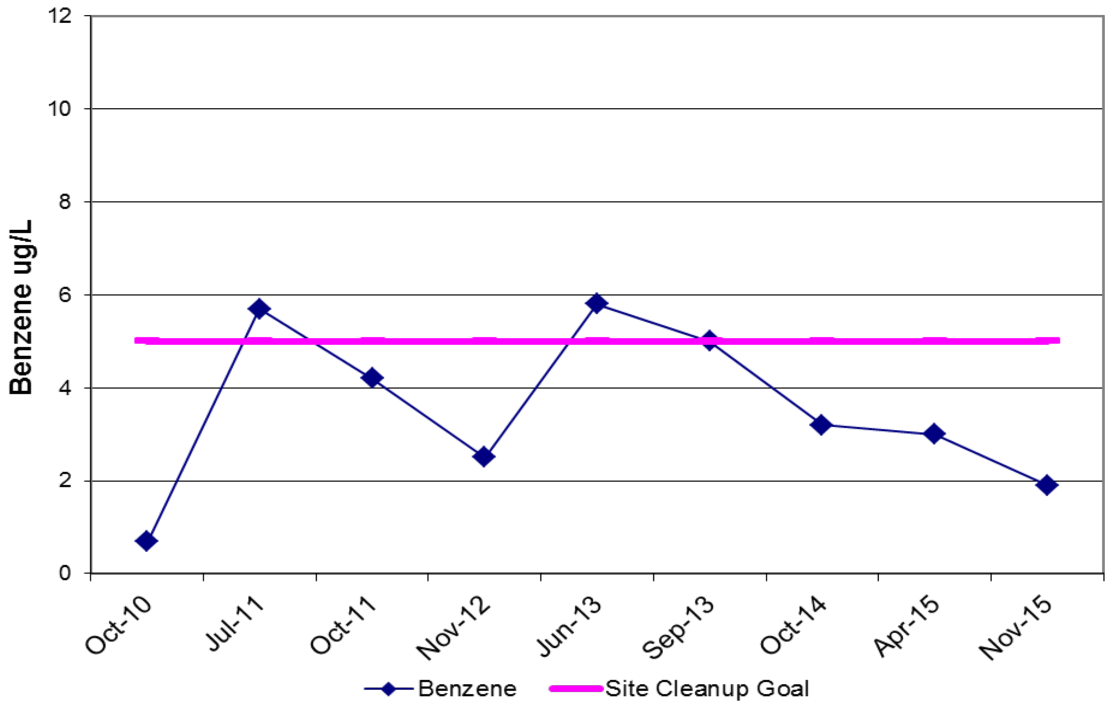
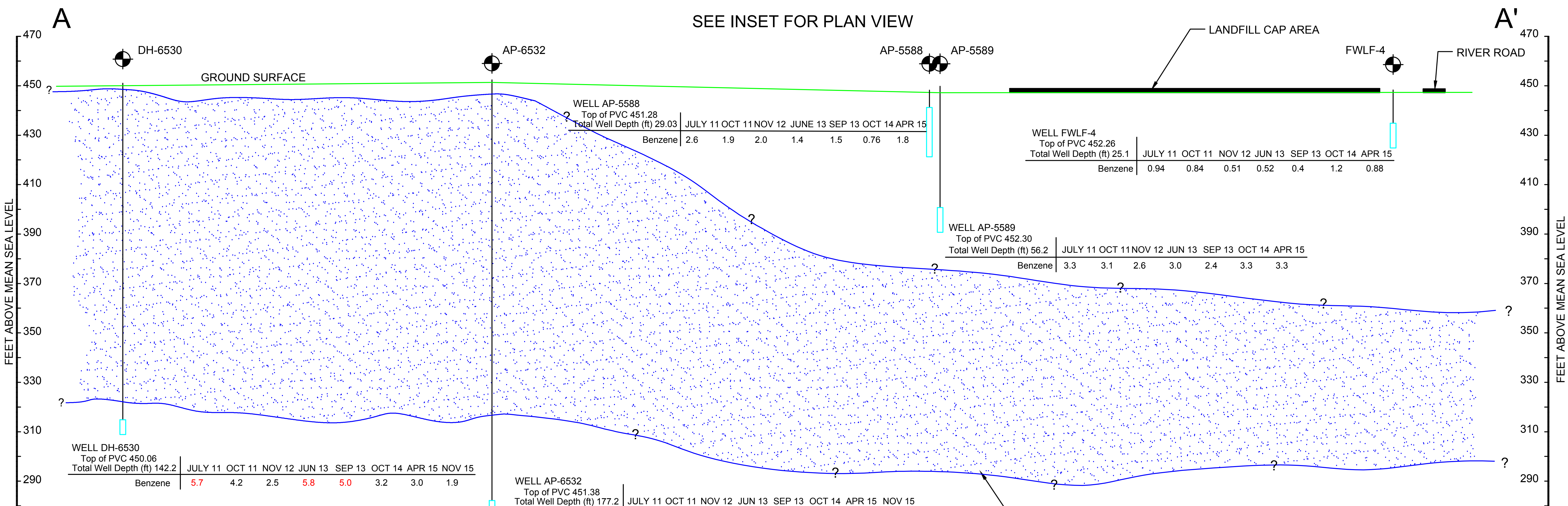


Figure 3-9 Historical Benzene Concentrations in AP-6530





WELL AP-5588

Top of PVC 451.28 Total Well Depth (ft) 29.03	JULY 11	OCT 11	NOV 12	JUNE 13	SEP 13	OCT 14	APR 15
Benzene	2.6	1.9	2.0	1.4	1.5	0.76	1.8

WELL FWLF-4

Top of PVC 452.26 Total Well Depth (ft) 25.1	JULY 11	OCT 11	NOV 12	JUN 13	SEP 13	OCT 14	APR 15
Benzene	0.94	0.84	0.51	0.52	0.4	1.2	0.88

WELL AP-5589

Top of PVC 452.30 Total Well Depth (ft) 56.2	JULY 11	OCT 11	NOV 12	JUN 13	SEP 13	OCT 14	APR 15
Benzene	3.3	3.1	2.6	3.0	2.4	3.3	3.3

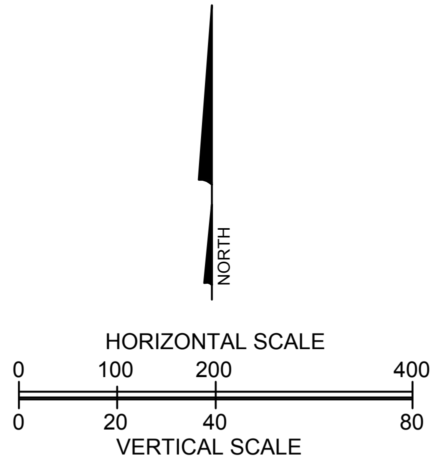
WELL DH-6530

Top of PVC 450.06 Total Well Depth (ft) 142.2	JULY 11	OCT 11	NOV 12	JUN 13	SEP 13	OCT 14	APR 15	NOV 15
Benzene	5.7	4.2	2.5	5.8	5.0	3.2	3.0	1.9

WELL AP-6532

Top of PVC 451.38 Total Well Depth (ft) 177.2	JULY 11	OCT 11	NOV 12	JUN 13	SEP 13	OCT 14	APR 15	NOV 15
Benzene	11.0	10.0	2.4	11.0	9.2	13	11	11

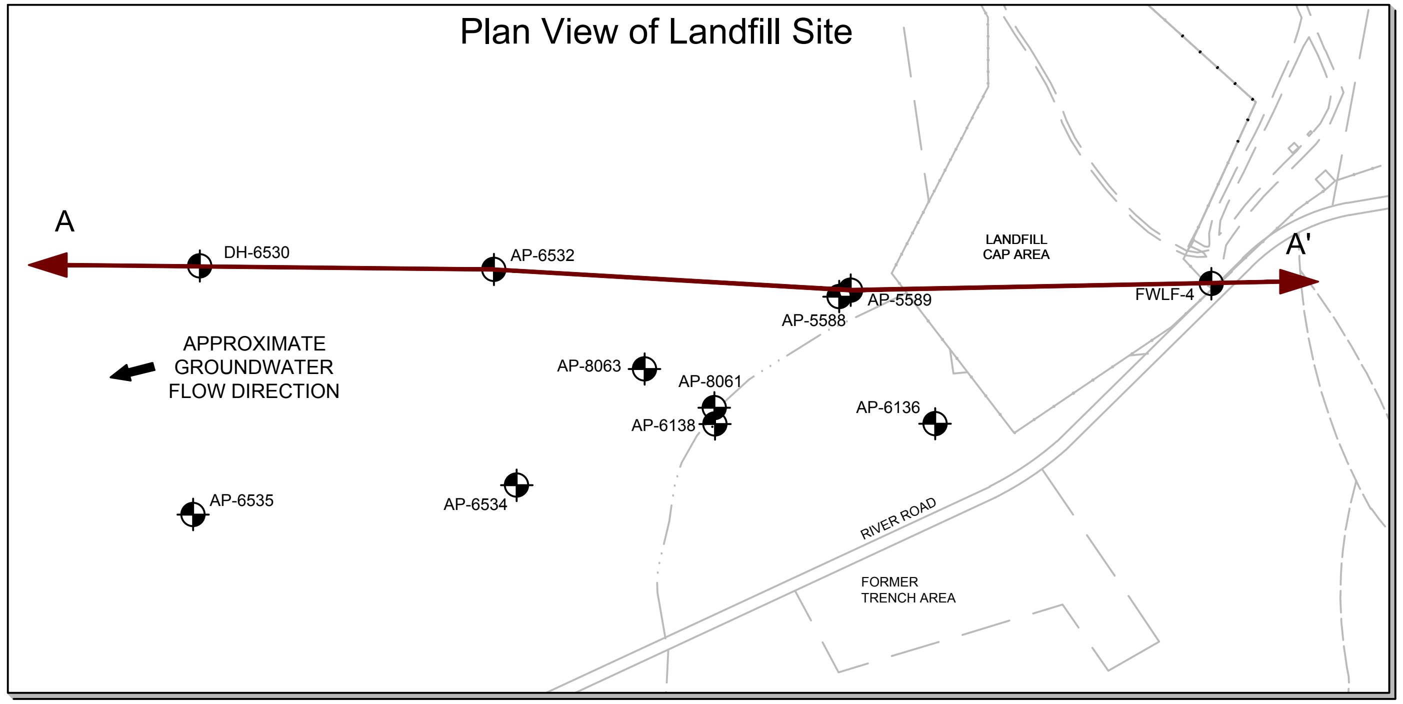
CONCEPTUALIZED APPROXIMATE
LOCATION OF DISCONTINUOUS
PERMAFROST



LEGEND

AP-6532	MONITORING WELL
µg/L	MICROGRAMS PER LITER
▯	SCREEN LENGTH
ND	INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANITATION LIMIT IS STATED IN PARENTHESES.

RAOs IN µg/L	
5	Benzene



KEY:

MONITORING WELL

WELL AP-6532

Top of PVC 451.38 Total Well Depth (ft) 177.2	JULY 11	OCT 11
Groundwater Elevation (feet)	435.67	434.38
Benzene	11.0	10.0

CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

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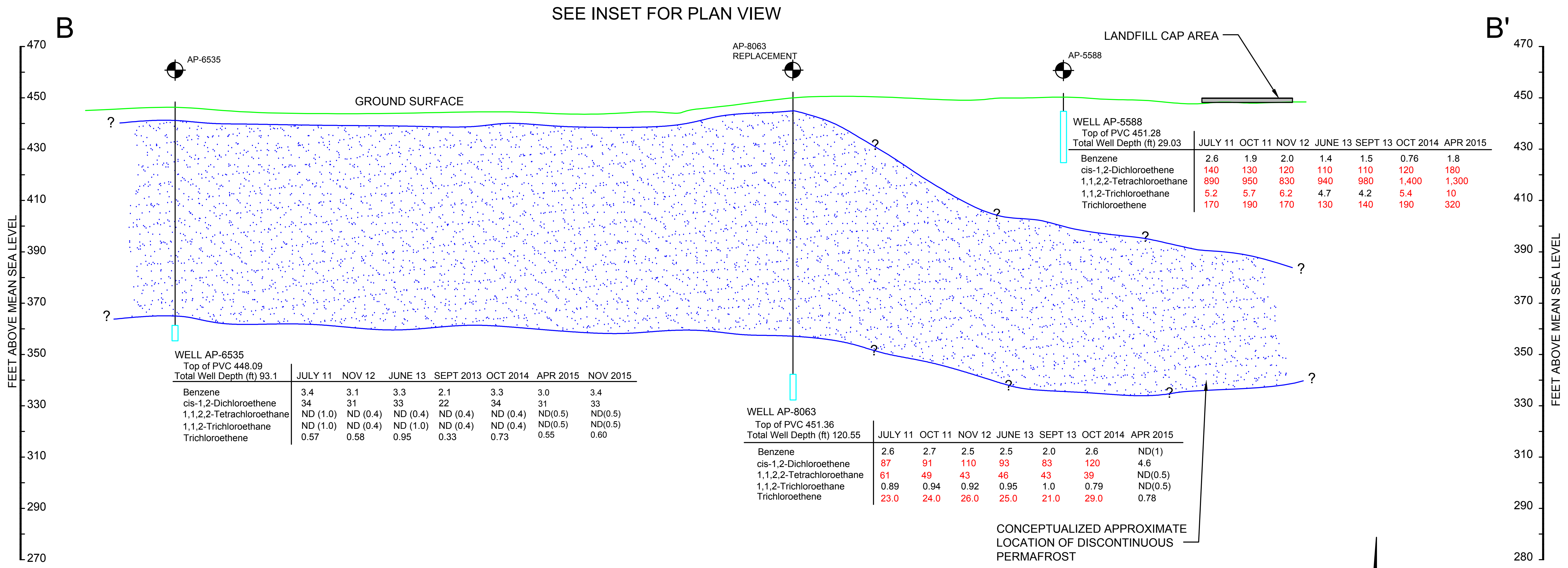
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Cross-Section A-A' View of Benzene Contamination

2015 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	3-10	1/17

SEE INSET FOR PLAN VIEW



WELL AP-5588
Top of PVC 451.28

Total Well Depth (ft) 29.03	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 2014	APR 2015
Benzene	2.6	1.9	2.0	1.4	1.5	0.76	1.8
cis-1,2-Dichloroethene	**140**	**130**	**120**	**110**	**110**	**120**	**180**
1,1,2,2-Tetrachloroethane	**890**	**950**	**830**	**940**	**980**	**1,400**	**1,300**
1,1,2-Trichloroethane	**5.2**	**5.7**	**6.2**	4.7	4.2	**5.4**	**10**
Trichloroethene	**170**	**190**	**170**	**130**	**140**	**190**	**320**

WELL AP-6535
Top of PVC 448.09

Total Well Depth (ft) 93.1	JULY 11	NOV 12	JUNE 13	SEPT 2013	OCT 2014	APR 2015	NOV 2015
Benzene	3.4	3.1	3.3	2.1	3.3	3.0	3.4
cis-1,2-Dichloroethene	34	31	33	22	34	31	33
1,1,2,2-Tetrachloroethane	ND (1.0)	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	ND (1.0)	ND (0.4)	ND (1.0)	ND (0.4)	ND (0.4)	ND(0.5)	ND(0.5)
Trichloroethene	0.57	0.58	0.95	0.33	0.73	0.55	0.60

WELL AP-8063
Top of PVC 451.36

Total Well Depth (ft) 120.55	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 2014	APR 2015
Benzene	2.6	2.7	2.5	2.5	2.0	2.6	ND(1)
cis-1,2-Dichloroethene	**87**	**91**	**110**	**93**	**83**	**120**	4.6
1,1,2,2-Tetrachloroethane	**61**	**49**	**43**	**46**	**43**	**39**	ND(0.5)
1,1,2-Trichloroethane	0.89	0.94	0.92	0.95	1.0	0.79	ND(0.5)
Trichloroethene	**23.0**	**24.0**	**26.0**	**25.0**	**21.0**	**29.0**	0.78

LEGEND

AP-6532 ⊕	MONITORING WELL
$\mu g/L$	MICROGRAMS PER LITER
▯	SCREEN LENGTH
ND	INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANITATION LIMIT IS STATED IN PARENTHESES.

RAOs IN $\mu g/L$

70	cis-1,2-Dichloroethene
5.2	1,1,2,2-Tetrachloroethane
5	1,1,2-Trichloroethane
5	Trichloroethene

KEY:

MONITORING WELL

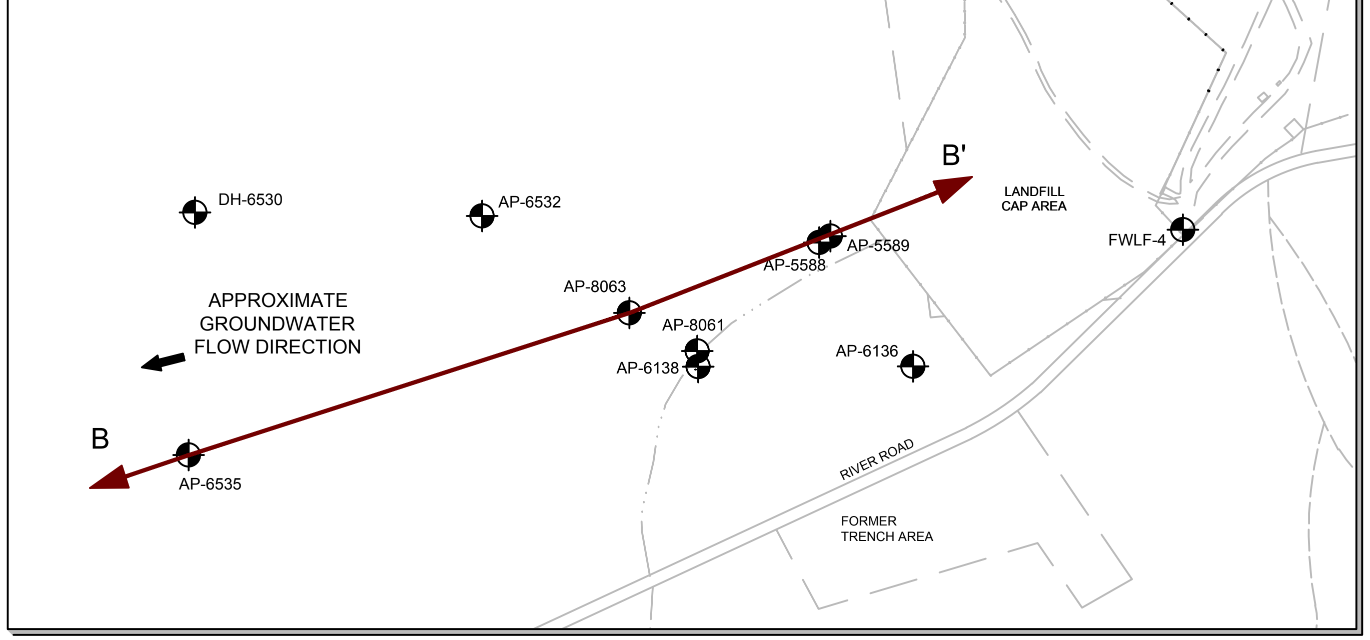
WELL AP-8063
Top of PVC 451.36

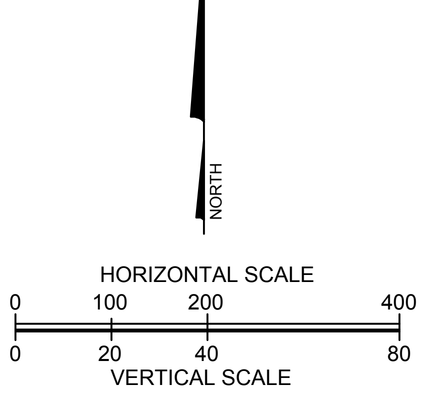
Total Well Depth (ft) 120.55	JULY 11	OCT 11
cis-1,2-Dichloroethene	**87**	**91**
1,1,2,2-Tetrachloroethane	**61**	**49**
1,1,2-Trichloroethane	0.89	0.94
Trichloroethene	**23.0**	**24.0**

CONCENTRATIONS IN MICROGRAMS PER LITER ($\mu g/L$)

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

Plan View of Landfill Site





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Cross-Section B-B' View of Groundwater Contamination

2015 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	3-11	1/17

4.0 INSTITUTIONAL CONTROL INSPECTION

Institutional Control (IC) site inspections were conducted at the Landfill on multiple days in 2015. The upgradient area that was the former leach field was inspected on August 17th, the Landfill cap and fence were inspected on September 4th, and all wells associated with the Landfill were inspected September 4th through the 9th and September 21st and 22nd. The Landfill cap and fence were observed to be in good condition. All groundwater monitoring wells sampled to evaluate natural attenuation of site contaminants were found to be in good condition with locking caps, except for AP-6138. An IC Inspection Form, photographs, and further information pertaining to the Landfill site inspection are included in 2015 Annual IC Inspection Report (anticipated 2016).

A summary of the IC Inspection and findings is provided below.

- The Landfill is appropriately covered and graded.
- Some trees along the fence line and a few trees on the landfill cap were observed to have grown; however, the trees are not impacting the integrity of the Landfill cap and no action to remove them at this time is recommended.
- There are no signs of damage to the Landfill face or slopes.
- Signage at the Landfill is intact and in good condition.
- Fencing around the Landfill is intact.
- All wells sampled in the Landfill monitoring program are in good condition. AP-8061 is slightly frost jacked; however, no significant change was noticed compared to the 2014 IC inspection. All wells were locked except for AP-6138, which was found missing a cap and a lock. Both the cap and lock were replaced at this well. In addition, over 100 wells associated with the Landfill, but no longer sampled, were located and inspected. Several wells that had frost jacked were cut down to the overcasing level and recapped and locked. Several wells were also found to be missing locks, and in some cases wells were missing both caps and locks. Missing locks and caps were replaced. Additional information about specific wells can be found in the 2015 Annual IC Inspection Report (anticipated 2016).

5.0 CONCLUSIONS AND RECOMMENDATIONS

The monitoring data collected during the 2015 sampling events was generally consistent with results detected during previous sampling events. The following conclusions and recommendations were discussed with RPMs during the February 2016 Federal Facility Agreement (FFA) Meetings. Recommendations for the monitoring program are also outlined in Table 5-1.

In general, contaminants appear to migrate along separate flow paths in groundwater downgradient of the Landfill site. Benzene is detected in all wells sampled downgradient of the landfill, typically at concentrations below the RAG; however, it appears that benzene is migrating below permafrost at concentrations exceeding RAGs in a predominately westerly flow path. Benzene is not seen at concentrations exceeding the RAG in deep downgradient wells that are along a southwesterly flow path. It is possible that the permafrost beneath the Landfill is discontinuous and benzene has migrated through permafrost; however, the presence of or depth to permafrost beneath the Landfill is unknown, and it is not known how permafrost affects groundwater flow at depth. Chlorinated solvents are less widespread than benzene in groundwater downgradient of the landfill and appear to be more prevalent on a southwesterly flow path. Specific sources of contamination within the landfill have not been investigated and it is possible that the chlorinated solvents originate from a separate spill than the petroleum contaminants. It appears that chlorinated solvents migrate at the water table downgradient of the landfill until permafrost is encountered, when they continue migrating below permafrost.

Shallow Wells (screened across the groundwater table)

Shallow wells sampled at the Landfill source area include FWLF-4 (upgradient), AP-5588 (immediately downgradient), and AP-8061 (downgradient) as well as three shallow upgradient wells (AP-10257, AP-10258, and AP-10259) installed in 2012 to investigate the leach field at Building 1191. The following summarizes the recommendations for shallow wells at the Landfill source area:

AP-5588 – Well AP-5588, located immediately downgradient of the Landfill source area, continues to exhibit the highest concentrations of most COCs; however, concentrations have remained relatively stable since sampling began in 1997 and although there was a slight increase in several COCs during the spring 2015 sampling event, overall the COCs are showing a stable to decreasing trend. Benzene has never been detected above the RAG in AP-5588. The sample frequency at this well was reduced to annual spring sampling in 2015 because historically COC concentrations have not varied significantly between the spring and fall sampling events.

<u>FWLF-4</u> – Bis(2-ethylhexyl)phthalate exceeded the RAG in fall 2014 and spring 2015 in this well. Prior to this, bis(2-ethylhexyl)phthalate exceeded the RAG in spring 2003 and fall 1998. The sample frequency at this well was reduced to annual spring sampling in 2015.

<u>AP-8061</u> – This shallow well is located within a thaw channel downgradient of the landfill. Benzene and TCE are detected above the RAGs in this well indicating that these contaminants are migrating at the water table within this thawed area southwest of the landfill. Benzene, which historically has been above the RAG in AP-8061, was below the RAG from 2011 through spring 2015. Benzene increased to above the RAG in fall 2015. TCE and 1,2-DCE are the only chlorinated solvents detected in this well. 1,2-DCE is consistently detected well below the RAG and TCE consistently exceeds the RAG. Overall TCE is showing a decreasing trend; although, it increased to above the RAG during the fall 2014 and fall 2015 sampling events. This well is sampled during the spring and fall to monitor potential downgradient migration of COCs.

<u>AP-10257 and AP-10258</u> – Benzene has been detected above the RAG in five of the six sampling events at AP-10257 and was detected above the RAG for the first time in AP-10258 during 2014; however, benzene was below the RAG during both 2015 sampling events in AP-10258. Bis(2-ethylhexyl)phthalate was also detected above the RAG in AP-10257 for the first time since sampling began at this well. These wells will continue to be sampled during the spring and fall of 2016 to monitor the presence of benzene upgradient of the Landfill.

<u>AP-10259</u> – No COCs have been detected in AP-10259 during the five sampling events since installation and this well was removed from the monitoring program following the spring 2015 sampling event.

<u>Intermediate Wells (screened below the groundwater table but above permafrost)</u>

Intermediate wells sampled at the Landfill source area include downgradient wells AP-5589, AP-6136, and AP-6138. The following summarizes the recommendations for intermediate wells at the Landfill source area:

<u>AP-5589</u> – Intermediate well AP-5589 is located a few feet from shallow well AP-5588. Contaminants detected in well AP-5588 are commonly detected in well AP-5589; however, COC concentrations typically do not exceed RAGs. Exceptions include PCA, which was detected above the RAG between 2005 and 2007 and again in the fall of 2009; vinyl chloride which has been detected slightly above the RAG only during three sampling events since 1997; and, TCE which was detected at the RAG for the first time during the spring 2007 sampling event and again during the fall 2009 sampling event. Bis(2-ethylhexyl) phthalate was detected above the RAG for the first time in AP-5589 during June 2013. The sample frequency at this well was reduced to annual spring sampling in 2015 in order to continue monitoring bis(2-ethylhexyl)phthalate that was detected above the RAG in spring 2013.

AP-6136 and AP-6138 – These wells were removed from the monitoring network following the spring 2015 sampling event based on COCs not being detected (or detected only at trace concentrations) in these wells since 2006. The only COC that has ever exceeded the RAG in either well is bis(2-ethylhexyl)phthalate.

Deep Wells (screened below permafrost)

Deep wells sampled at the Landfill source area include downgradient wells AP-8063, AP-6532, AP-6535, and AP-6530. The following summarizes the recommendations for deep wells at the Landfill source area:

AP-8063 – While benzene is consistently detected below the RAG in this well, it has never exceed the RAG; however chlorinated solvents TCE, PCA and cis-1,2,-DCE are consistently detected above RAGs in AP-8063. Overall concentrations of TCE appear to be stable. Between 2001 and 2007, PCA concentrations decreased significantly, but concentrations have generally been increasing since 2008; although, a clear trend is not observed. Cis-1,2-DCE concentrations fluctuate; however, overall concentrations have increased since sampling began in 2001. The sample frequency at this well was reduced to annually in the spring during the 2015 sampling event because historically COC concentrations have not varied significantly between the spring and fall sampling events; however, due to anomalous results from the spring 2015 sampling event (all COC were non-detect) it is recommended that the sampling frequency at AP-8063 return to biannually.

AP-6535 – Benzene is detected, but has not exceeded the RAG in well AP-6535 since sampling this well began in 2010. TCE and cis-1,2,-DCE have also been detected in this downgradient well, but at concentrations well below RAGs. This well will continue to be sampled during the spring and fall to monitor potential downgradient migration of contaminants in the subpermafrost aquifer.

AP-6532 and AP-6530 – Historical analytical results indicate that benzene has migrated at concentrations above the RAG to downgradient deep wells AP-6532 and AP-6530. Benzene was above the RAG during the spring and fall 2015 sampling events in AP-6532, but was below the RAG in farther down gradient well AP-6530 in 2015. Wells AP-6532 and AP-6530 will continue to be sampled during the spring and fall to monitor potential downgradient migration of benzene in the subpermafrost aquifer.

Table 5-1 Summary of Monitoring Well Sampling Recommendations

Well	Sample Annually in the Spring	Sample in the Spring and Fall	Removed from the Monitoring Network
AP-8061		X	
AP-10257		X	
AP-10258		X	
AP-6532		X	
AP-6535		X	
AP-6530		X	
AP-8063		X	
AP-5588	X		
FWLF-4	X		
AP-5589	X		
AP-10259			X
AP-6136			X
AP-6138			X

Note – green denotes a shallow well, blue an intermediate well, and red a deep well

Methane Analysis

It is recommended that analysis of methane be removed from the sampling program. Methane analysis is no longer required under the Landfill permit.

Institutional Control Survey

An inspection of the capped section of the Fort Wainwright Landfill should be conducted to ensure that ICs are being met. This would include an inspection of the fence surrounding the area, the Landfill cap, and the monitoring wells. Site-specific ICs for these sites can be found in Appendix A of the Third Fort Wainwright Five-Year Review (USARAK, 2011).

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APPENDIX A

GROUNDWATER SAMPLING FORMS, GROUNDWATER FIELD MEASUREMENTS, AND FIELD FORMS

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #:
Date: 4/7/15
Time: 0855
Sampler: CB
Weather: SUN
QA/QC Sample ID/Time/LOCID: ——

Site Location: LANDFILL
Probe/Well #: FWLF-4
Sample ID: 15FWOU4 01 WG
Outside Temperature: 36°F
MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product: ——

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 25.03
Depth to Water from TOC (feet): - 17.93
Column of Water in Probe/Well (feet): = 7.10
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.2

Sampling Depth

Well Screened [✓ Across] / Below water table
Depth tubing / pump intake set* approx. 19.9 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.66	0.784	1.80	6.39	82.1	73.12	18.17
0.8	10	1.57	0.781	1.50	6.45	60.5	55.55	18.17
1.2	15	1.55	0.779	1.33	6.48	57.3	28.11	18.17
1.6	20	1.47	0.775	1.05	6.45	43.6	17.09	18.17
2.0	25	1.50	0.772	0.90	6.50	43.7	10.71	18.18
2.4	30	1.53	0.771	0.87	6.49	45.8	7.72	18.18
2.8	35	1.51	0.772	0.85	6.50	42.1	6.92	18.18
FINAL								

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not? → INITIAL .15 GALLONS
Water Color: [✓ Clear] Yellow [✓ Orange] Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N Comments:
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO~~ [✓ Iron/Sulfate] (VOC, SVOC, METALS, METHANE)
pH checked for DRO samples: ~~Y/N~~ Approximate HCl volume added (mL):

Purge Water

Gallons generated: 2.8 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: CB Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form **Operable Unit 4** **Ft. Wainwright, Alaska**

Project #: 6033-40
Date: 4/7/15
Time: 1045
Sampler: SK
Weather: Overcast/windy
QA/QC Sample ID/Time/LOCID:

Site Location: OU4 Landfill
Probe/Well #: AP-6532
Sample ID: 15FWOU4 02 WG
Outside Temperature: 41°F
MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 13 Water Level: 9

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 173.78
Depth to Water from TOC (feet): - 17.46
Column of Water in Probe/Well (feet): = 156.32
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 25.4

Sampling Depth

Well Screened ~~Across~~ / [✓ Below] water table
Depth tubing / pump intake set* approx. 168 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.44	0.379	2.74	6.05	30.7	29.90	17.49
0.8	10	1.32	0.379	2.15	6.05	29.3	25.87	17.49
1.2	15	1.23	0.378	1.64	6.03	27.4	19.44	17.49
1.6	20	1.20	0.379	1.51	6.03	26.5	19.87	17.49
2.0	25	1.18 ✓	0.379 ✓	1.35 X	6.03 ✓	25.3 ✓	10.97 X	17.49
2.4	30	1.16	0.379	1.22	6.03	24.5	9.66	17.49

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not? 30 gallons used to thaw well w/ Hotsie
Did drawdown stabilize? [✓ Yes] / No If no, why not? ↳ 45 gallons removed upon thawing
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not? the well. SK
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock: [✓ Y] N Labeled with LOC ID: [✓ Y] N Comments:
Sheen: Yes [✓ No] Odor: Yes [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO,~~ [✓ Iron, Sulfate] VOC/SVOC/Methane/Metals
pH checked for DRO samples: ~~Y/N~~ Approximate HCl volume added (mL):

Purge Water

Gallons generated: 3.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not? DERA
Sampler's Initials: SK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #:

Date: 4/7/15

Time: 1055

Sampler: CB

Weather: CLOUDY

Site Location: LANDFILL

Probe/Well #: AP-6138

Sample ID: 15FWOU4 03 WG

Outside Temperature: 41°F

QA/QC Sample ID/Time/LOCID: ―

MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 86.22

Depth to Water from TOC (feet): - 10.67

Column of Water in Probe/Well (feet): = 75.55

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 12.3

Sampling Depth

Well Screened Across / [✓ Below] water table

Depth tubing / pump intake set* approx. 81.2 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.32	0.471	1.51	6.55	39.1	26.21	10.70
0.8	10	1.28	0.464	1.07	6.58	34.6	14.09	10.70
1.2	15	1.30	0.464	0.97	6.61	27.1	5.36	10.70
1.6	20	1.29	0.463	0.86	6.61	22.5	5.72	10.70
2.0	25	1.31	0.463	0.75	6.63	20.9	4.09	10.70
2.4	30	1.27	0.461	0.73	6.62	17.1	5.11	10.70
2.8	35	1.28	0.462	0.72	6.62	15.6	2.96	10.70
3.2	40	1.28	0.461	0.71	6.62	12.1	3.69	10.70
3.4	FINAL							

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?

Did drawdown stabilize? [✓ Yes] / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] /No If no, why not?

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock: [✓ Y] N Labeled with LOC ID: [✓ Y] N

Sheen: Yes / [✓ No] Odor: Yes / [✓ No]

Comments: USED WELL BULLET TO

Notes/Comments: GET TUBE IN SCREENED INTERVAL

Laboratory Analyses (Circle): VOC ~~BTEX, GRO, DRO~~ [✓ Iron, Sulfate] [✓ + Methane + SVOC + Metals]

pH checked for DRO samples: Y/N Approximate HCl volume added (mL):

Purge Water

Gallons generated: 3.4 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: CB Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form | **Operable Unit 4** | **Ft. Wainwright, Alaska**

Project #: 6033-40
Date: 4/7/15
Time: 1300
Sampler: JK
Weather: Overcast
Site Location: OU4
Probe/Well #: AP-6535
Sample ID: 15FWOU4 04 WG
Outside Temperature: 40°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/[✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 13 Water Level: #9
Free Product Observed in Probe/Well? Yes/[✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 90.80
Depth to Water from TOC (feet): - 14.95
Column of Water in Probe/Well (feet): = 75.85
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 12.36

Sampling Depth

Well Screened ~~Across~~ / [✓ Below] water table
Depth tubing / pump intake set* approx. 88 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	2.34	0.378	4.57	6.07	38.2	19.51	14.99
0.6	10	2.33	0.400	3.53	6.11	30.1	13.81	14.99
1.2	15	2.22	0.418	2.96	6.14	21.8	11.29	14.99
1.6	20	2.25	0.426	2.30	6.16	15.0	15.41	14.99
2.0	25	2.23	0.434	[illegible].242	6.17	9.2	14.88	14.99
2.4	30	2.20 ✓	0.438 ✓	2.38 ✓	6.17 ✓	6.9 ✓	11.94 x	14.99

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] /N Labeled with LOC ID: [✓ Y] N Comments:
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO, Iron, Sulfate~~ VOC/Methane/SVOC/Fe/SO4/Metals
pH checked for [✓ DRO] metals samples: [✓ Y] N Approximate HCl volume added (mL): 0

Purge Water
Gallons generated: 3.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: JK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #:

Date: 4/7/15

Time: 1210

Sampler: CB

Weather: CLOUDY

QA/QC Sample ID/Time/LOCID: —

Site Location: LANDFILL

Probe/Well #: AP-8061

Sample ID: 15FWOU4 05 WG

Outside Temperature: 43°F

MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product:________

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 25.33

Depth to Water from TOC (feet): - 10.07

Column of Water in Probe/Well (feet): = 15.26

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 2.5

Sampling Depth

Well Screened Across / [✓ Below] water table

Depth tubing / pump intake set* approx. 20.3 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.18	0.719	1.30	6.72	1.1	101.5	10.07
0.8	10	1.24	0.719	0.88	6.76	-15.8	59.69	10.07
1.2	15	1.23	0.718	0.77	6.78	-26.9	30.0	10.07
1.6	20	1.25	0.718	0.75	6.78	-38.2	26.14	10.07
2.0	25	1.17	0.718	0.66	6.78	-41.7	14.69	10.07
2.4	30	1.15	0.718	0.60	6.78	-45.9	10.11	10.07
2.8	35	1.20	0.717	0.52	6.78	-51.5	9.16	10.07
3.2	40	1.30	0.717	0.50	6.78	-56.2	7.09	10.07
3.6	45	1.35	0.717	0.49	6.78	-57.9	8.56	10.07
4.0	50	1.38	0.717	0.48	6.79	-58.2	9.12	10.07
4.2	FINAL							

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?

Did drawdown stabilize? [✓ Yes] / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not? INITIAL 0.1 GALLONS

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments:

Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO~~, [✓ Iron, Sulfate + Methane + SVOC + Metals + VOC]

pH checked for DRO samples: Y / N Approximate HCl volume added (mL):______

Purge Water

Gallons generated: 4.2 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: CB Disposal method: Store at [✓ DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #: 6033-40
Date: 4/7/15
Time: 1510
Sampler: SK
Weather: Overcast
Site Location: OU4 Landfill
Probe/Well #: AP-6530
Sample ID: 15FWOU4 06 WG
Outside Temperature: 42°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 13 Water Level: #9

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 139.18
Depth to Water from TOC (feet): - 16.70
Column of Water in Probe/Well (feet): = 122.48
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 19.96

Sampling Depth

Well Screened ~~Across~~ / [✓ Below] water table
Depth tubing / pump intake set* approx. ~~120~~ 134 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.07	0.447	3.38	6.24	33.1	16.57	16.74
0.8	10	1.00	0.482	1.62	6.31	18.3	6.67	16.75
1.2	15	0.96	0.490	1.27	6.32	9.1	6.02	16.75
1.6	20	1.06	0.490	1.13	6.32	4.8	2.97	16.75
2.0	25	1.16	0.492	1.23	6.33	-0.5	2.23	16.75
2.4	30	1.07 ✓	0.494 ✓	1.12 ✓	6.34 ✓	-3.3 ✓	1.98 ✓	16.74

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments:
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO~~ [✓ Iron], [✓ Sulfate] VOC/SVOC/Methane/Metals
pH checked for DRO samples: ~~Y / N~~ Approximate HCl volume added (mL):

Purge Water

Gallons generated: 3.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: SK Disposal method: [✓ Store at DERA] Bldg / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #:

Date: 4/7/15

Time: 1520

Sampler: CB

Weather: CLOUDY + WIND

Site Location: LANDFILL

Probe/Well #: AP-5588

Sample ID: 15FWOU4 07 WG

Outside Temperature: 46 °F

QA/QC Sample ID/Time/LOCID: [redacted]

MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 29.12

Depth to Water from TOC (feet): - 17.00

Column of Water in Probe/Well (feet): = 12.12

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 2

Sampling Depth

Well Screened [✓ Across] / ~~Below~~ water table 20' SCREEN

Depth tubing / pump intake set* approx. 19 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.38	1.154	1.35	6.58	-5.1	136.9	17.02
0.8	10	1.40	1.179	1.01	6.60	-15.6	106.6	17.02
1.2	15	1.42	1.195	0.87	6.62	-22.9	96.0	17.02
1.6	20	1.44	1.218	0.79	6.63	-31.6	55.7	17.02
2.0	25	1.45	1.230	0.75	6.63	-37.1	36.21	17.02
2.4	30	1.46	1.275	0.70	6.63	-40.6	25.41	17.02
2.8	35	1.49	1.239	0.62	6.64	-45.5	20.08	17.03
3.0	40	1.50	1.240	0.65	6.64	-46.9	17.92	17.03
3.4	45	1.49	1.239	0.63	6.64	-48.1	17.59	17.03
4	50	1.51	1.237	0.61	6.64	-49.6	16.11	17.03
4.1	FINAL							

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?

Did drawdown stabilize? [✓ Yes] / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock: [✓ Y]/ N Labeled with LOC ID: [✓ Y]/ N Comments:

Sheen: Yes / [✓ No] Odor: [✓ Yes]/ No VERY SLIGHT Notes/Comments: TOP OF WELL PVC BROKEN - PIC

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO~~, Iron, Sulfate + VOC + Methane + SVOC + Metals

pH checked for DRO samples: ~~Y/N~~ Approximate HCl volume added (mL):

Purge Water

Gallons generated: 4.1 Containerized and disposed ~~as IDW~~? [✓ Yes]/ No If No, why not?

Sampler's Initials: CB Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form **Operable Unit 4** **Ft. Wainwright, Alaska**

Project #:

Date: 4/8/15

Time: 1325

Sampler: CB

Weather: Pt CLOUDY

QA/QC Sample ID/Time/LOCID: ——

Site Location: LANDFILL

Probe/Well #: AP-10258MW

Sample ID: 15FWOU4 08 WG → ORIGINAL 08 WAS A DUP THAT WAS NOT USED

Outside Temperature: 39°F

MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes/[✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 23.80

Depth to Water from TOC (feet): - 19.15

Column of Water in Probe/Well (feet): = 4.65

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 0.8

Sampling Depth

Well Screened [✓ Across] / Below water table

Depth tubing / pump intake set* approx. 21 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.40	0.571	1.26	6.13		5.29	19.15
0.8	10	1.46	0.578	1.14	6.16	130.6	6.08	19.15
1.2	15	1.58	0.585	0.80	6.17		4.76	19.16
1.6	20	1.54	0.589	0.73	6.18	131.0	5.11	19.16
2.0	25	1.55	0.590	0.75	6.18	129.0	2.96	19.16
2.1	FINAL							

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?

Did drawdown stabilize? [✓ Yes] / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments:

Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO,~~ [✓ Iron, Sulfate + Methane + SVOC + VOC + Metals]

pH checked for DRO samples: Y/N Approximate HCl volume added (mL):

Purge Water

Gallons generated: 2.1 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: CB Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form **Operable Unit 4** **Ft. Wainwright, Alaska**

Project #:

Date: 4/7/15

Time: 1645

Sampler: CB

Weather: CLOUDY

QA/QC Sample ID/Time/LOCID: —

Site Location: LANDFILL

Probe/Well #: AP-5589

Sample ID: 15FWOU4 09 WG

Outside Temperature: 50

MS/MSD Performed? Yes [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes/[✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 56.32

Depth to Water from TOC (feet): - 17.98

Column of Water in Probe/Well (feet): = 38.34

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 6.2

Sampling Depth

Well Screened Across / [✓ Below] water table

Depth tubing / pump intake set* approx. 51 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	2.21	0.945	0.95	6.72	-49.1	8.48	17.99
0.8	10	2.15	0.948	0.80	6.71	-53.7	6.91	17.99
1.2	15	2.10	0.950	0.67	6.70	-57.2	5.00	17.99
1.6	20	2.07	0.950	0.61	6.70	-66.3	5.19	17.99
2.0	25	2.19	0.995	0.47	6.72	-70.9	4.06	17.99
2.4	30	2.20	0.995	0.47	6.70	-71.5	4.92	17.99
2.8	35	2.24	0.999	0.45	6.71	-72.3	5.01	17.99
2.9	FINAL							

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?

Did drawdown stabilize? [✓ Yes] / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] N Comments:

Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): [✓ ~~BTEX, GRO, DRO~~, Iron, Sulfate + Methane + VOC + Metals + SVOC]

pH checked for DRO samples: ~~Y/N~~ Approximate HCl volume added (mL):

Purge Water

Gallons generated: 2.9 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: CB Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #: 6033-40
Date: 4/8/15
Time: 1350
Sampler: JK
Weather: P. Cloudy
QA/QC Sample ID/Time/LOCID: ——

Site Location: OU4 Landfill
Probe/Well #: AP-6136
Sample ID: 15FWOU4 10 WG
Outside Temperature: 25°F
MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 13 Water Level: #9

Free Product Observed in Probe/Well? Yes/ [✓ No]
If Yes, Depth to Product: ∅

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 96.27
Depth to Water from TOC (feet): - 19.74
Column of Water in Probe/Well (feet): = 76.53
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 12.5

Sampling Depth

Well Screened ~~Across~~ / [✓ Below] water table
Depth tubing / pump intake set* approx. 91 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	3.11	0.282	11.22	6.09	33.2	6.68	19.75
0.8	10	2.54	0.288	7.75	6.09	25.7	6.28	19.75
1.2	15	2.68	0.301	4.56	6.11	16.8	5.57	19.75
1.6	20	2.65	0.304	2.99	6.12	10.7	5.32	19.75
2.0	25	2.60	0.304	2.80	6.12	7.5	5.15	19.75
2.4	30	2.68	0.304	2.69	6.14	9.8	5.04	19.75

JK

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments:
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO, Iron, Sulfate~~ VOC/SVOC/Fe/SO4/Metals/Methane
pH checked for DRO samples: ~~Y/N~~ Approximate HCl volume added (mL):

Purge Water

Gallons generated: 3.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: JK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form　Operable Unit 4　Ft. Wainwright, Alaska

Project #: 6033-40
Date: 4/8/15
Time: 1015
Sampler: JK
Weather: P. Cloudy

Site Location: OU4
Probe/Well #: AP-8063
Sample ID: 15FWOU4 11 WG

Outside Temperature: 25°F

QA/QC Sample ID/Time/LOCID: 15FWOU412WG / 1030 / AP-6060

MS/MSD Performed? [✓ Yes]/ No

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 6　Turbidity Meter #: 13　Water Level: #9

Free Product Observed in Probe/Well? Yes/ [✓ No]　If Yes, Depth to Product: Ø

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 120.64
Depth to Water from TOC (feet): - 17.33
Column of Water in Probe/Well (feet): = 103.31
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 16.8

Sampling Depth

Well Screened ~~Across~~ / [✓ Below] water table
Depth tubing / pump intake set* approx. 115.5 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	2.26	0.178	10.38	6.23	43.0	34.40	17.33
0.8	10	0.73	0.174	7.28	6.20	43.0	47.81	17.33
1.2	15	0.75	0.173	1.82	6.20	39.9	49.73	17.33
1.6	20	0.71	0.173	1.72	6.19	38.8	47.75	17.33
2.0	25	0.78	0.172	1.53	6.21	37.2	49.20	17.33
2.4	30	0.80	0.171	1.37	6.22	35.4	49.62	17.33

JK

Did groundwater parameters stabilize? [✓ Yes] /No　If no, why not?
Did drawdown stabilize? [✓ Yes]/ No　If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No　If no, why not?
Water Color: [✓ Clear]　Yellow　Orange　Brown/Black (Sand/Silt)　Other:
Well Condition: Lock [✓ Y] / N　Labeled with LOC ID [✓ Y] / N　Comments:
Sheen: Yes/ [✓ No]　Odor: Yes / [✓ No]　Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO, Iron, Sulfate~~ VOC/SVOC/Fe/SO4/ Methane/Metals
pH checked for DRO samples: ~~Y/N~~　Approximate HCl volume added (mL):

Purge Water
Gallons generated: 3.0　Containerized and ~~disposed~~ as IDW? [✓ Yes] No　If No, why not?
Sampler's Initials: JK　Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form **Operable Unit 4** **Ft. Wainwright, Alaska**

Project #:
Date: 4/8/15
Time: 1120
Sampler: CB
Weather: SUNNY
Site Location: LANDFILL
Probe/Well #: AP-10257MW
Sample ID: 15FWOU4 13 WG
Outside Temperature: 36 °F
[✓ QA/QC Sample] ID/Time/LOCID: 15FWOU414WG / 1135 / AP-7070
MS/MSD Performed? [✓ Yes] / No

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes / [✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 24.50
Depth to Water from TOC (feet): - 19.65
Column of Water in Probe/Well (feet): = 4.85
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 0.8

Sampling Depth

Well Screened [✓ Across] / Below water table
Depth tubing / pump intake set* approx. 21.6 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.21	0.525	2.16	6.15	150.6	61.15	19.65
0.8	10	1.29	0.530	1.50	6.16	145.6	36.28	19.65
1.2	15	1.35	0.528	1.05	6.21	139.9	19.15	19.65
1.6	20	1.39	0.529	0.97	6.20	137.6	19.86	19.65
2.0	25	1.59	0.530	0.95	6.22	137.2	17.82	19.65
2.4	30	1.62	0.534	0.95	6.22	135.6	17.88	19.65
2.8	35	1.60	0.532	0.92	6.21	135.2	16.58	19.65
2.9	FINAL							

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N Comments:
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO~~, [✓ Iron, Sulfate + SVOC + VOC + Methane + Metals]
pH checked for DRO samples: ~~Y / N~~ Approximate HCl volume added (mL):

Purge Water

Gallons generated: 2.9 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: CB Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form | **Operable Unit 4** | **Ft. Wainwright, Alaska**

Project #:

Date: 4/8/15

Time: 1440

Sampler: LB

Weather: MOSTLY CLOUDY

Site Location: LANDFILL

Probe/Well #: AP-10259MW

Sample ID: 15FWOU4 15 WG

Outside Temperature: 41 °F

QA/QC Sample ID/Time/LOCID:

MS/MSD Performed? Yes [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 4 Turbidity Meter #: 12 Water Level: 13

Free Product Observed in Probe/Well? Yes/[✓ No] If Yes, Depth to Product:____________

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 23.43

Depth to Water from TOC (feet): - 19.60

Column of Water in Probe/Well (feet): = 3.83

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 0.6

Sampling Depth

Well Screened [✓ Across] / Below water table

Depth tubing / pump intake set* approx. 21.5 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.92	0.888	4.36	6.60	106.7	7.29	19.68
0.8	10	1.96	0.891	3.76	6.61	99.7	6.91	19.70
1.2	15	2.00	0.902	3.00	6.62	95.5	6.50	19.71
1.6	20	2.05	0.906	2.87	6.64	94.4	6.79	19.71
2.0	25	2.05	0.908	2.81	6.65	93.0	2.51	19.71
2.4	30	2.05	0.910	2.79	6.66	92.7	2.90	19.71
2.5	FINAL							

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?

Did drawdown stabilize? [✓ Yes] / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Locked [✓ Y] / N Labeled with LOC ID [✓ Y] / N Comments:

Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): ~~BTEX, GRO, DRO~~, [✓ Iron, Sulfate + Methane + VOC + SVOC + Metals]

pH checked for DRO samples: ~~Y~~/N Approximate HCl volume added (mL):____________

Purge Water

Gallons generated: 2.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: LB Disposal method: Store at [✓ DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #:

Date: 4/8/15

Time: 1515

Sampler: —

Weather:

Site Location: LANDFILL

Probe/Well #: AP-6000

Sample ID: 15FWOU4 16 WG

Outside Temperature:

QA/QC Sample ID/Time/LOCID:

MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump / Submersible / Bladder

Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # ______ Turbidity Meter #:______ Water Level:______

Free Product Observed in Probe/Well? Yes/No If Yes, Depth to Product:______

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc):

Depth to Water from TOC (feet): -

Column of Water in Probe/Well (feet): =

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal):

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx.______ feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
	PE	SAMPLE						
		VOC,	SVOC,		total		metals	

Did groundwater parameters stabilize? Yes / No If no, why not?

Did drawdown stabilize? Yes / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?

Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock: Y / N Labeled with LOC ID: Y / N Comments:

Sheen: Yes / No Odor: Yes / No Notes/Comments:

Laboratory Analyses (Circle): BTEX, GRO, DRO, Iron, Sulfate

pH checked for DRO samples: Y / N Approximate HCl volume added (mL):______

Purge Water

Gallons generated:______ Containerized and disposed as IDW? Yes / No If No, why not?

Sampler's Initials:______ Disposal method: Store at DERA Bldg / Emerald Environmental / GAC treatment and surface discharge / other

15FW0U417WQ

Trip Blank

4/7/15 0800

VOC

Methane

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #: 6033-40
Date: 11/6/15
Time: 1030
Sampler: JK
Weather: Cloudy / Snow
QA/QC Sample ID/Time/LOCID:

Site Location: Landfill
Probe/Well #: AP-8061
Sample ID: 15FWOU4 18 WG
Outside Temperature: 27
MS/MSD Performed? Yes / [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 5 Turbidity Meter #: 12 Water Level: SOL

Free Product Observed in Probe/Well? Yes / [✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 25.33
Depth to Water from TOC (feet): - 7.71
Column of Water in Probe/Well (feet): = 17.62
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 2.87

Sampling Depth

Well Screened ~~Across~~ / [✓ Below] water table
Depth tubing / ~~pump~~ intake set* approx. 20.3 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	1.44	0.698	0.37	3.07	102.3	3.75	7.72
0.8	10	1.44	0.699	0.32	3.45	74.8	3.31	7.72
1.2	15	1.44	0.699	0.29	3.68	58.6	2.81	7.72
1.6	20	1.43	0.700	0.28	3.83	48.6	2.49	7.72
2.0	25	1.42 ✓	0.700 ✓	0.28 ✓	3.97 ×	39.7 ×	2.39 ✓	7.72
2.4	30	1.42	0.699	0.26	4.10	33.0	2.18	7.72
2.8	35	1.42	0.700	0.25	4.13	28.7	2.07	7.72

JK

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments:
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ METHANE], [✓ IRON], [✓ SULFATE], [✓ METALS]
pH checked for ~~DRO~~ metals samples: [✓ Y] / N Approximate HCl volume added (mL):

Purge Water

Gallons generated: 3.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: JK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #: 6033-40
Date: 11/6/15
Time: 1150
Sampler: SK
Weather: Snow
QA/QC Sample ID/Time/LOCID: —
Site Location: CAT
Probe/Well #: AP-10258MW
Sample ID: 15FWOU4 19 WG
Outside Temperature: 29
MS/MSD Performed? Yes/[✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 5 Turbidity Meter #: 12 Water Level: SOL 14
Free Product Observed in Probe/Well? Yes/[✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well
Total Depth in Probe/Well (feet btoc): 23.80
Depth to Water from TOC (feet): - 16.77
Column of Water in Probe/Well (feet): = 7.03
Circle: Gallons per foot of 1.25" (X 0.064) or 2" [✓ (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.15

Sampling Depth 10' screen
Well Screened [✓ Across] / Below water table
Depth tubing / pump intake set* approx. 18.8 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	3.12	0.540	0.84	5.15	166.6	8.03	16.79
0.8	10	3.20	0.552	0.51	5.30	167.9	7.01	16.79
1.2	15	3.01	0.552	0.43	5.36	167.4	3.85	16.79
1.6	20	3.10	0.555	0.39	5.33	169.8	3.77	16.79
2.0	25	3.11	0.555	0.33	5.41	168.4	3.24	16.79
2.4	30	3.07	0.554	0.31	5.42	168.6	3.15	16.79

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N Comments:
Sheen: Yes/[✓ No] Odor: Yes/[✓ No] Notes/Comments:

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ METHANE], [✓ IRON], [✓ SULFATE], [✓ METALS]
pH checked for ~~DRO~~ metals samples: [✓ Y] / N Approximate HCl volume added (mL): 0

Purge Water
Gallons generated: 2.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: SK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form Operable Unit 4 Ft. Wainwright, Alaska

Project #: 6033-40
Site Location: CAT shed
Date: 11/6/15
Probe/Well #: AP-10257MW
Time: 1330
Sample ID: 15FWOU4 20 WG
Sampler: JK
Weather: Snow
Outside Temperature: 30°F
QA/QC Sample ID/Time/LOCID: 15FWOU421WG/1350/AP-2020
MS/MSD Performed? [✓ Yes]/No

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 5 Turbidity Meter #: 12 Water Level: SOL 14

Free Product Observed in Probe/Well? Yes/[✓ No] If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 24.42
Depth to Water from TOC (feet): - 17.25
Column of Water in Probe/Well (feet): = 7.17
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.17

Sampling Depth

Well Screened [✓ Across] / Below water table
Depth tubing / pump intake set* approx. 19.25 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	2.79	1.117	0.36	5.13	136.7	17.51	17.29
0.8	10	2.76	1.150	0.26	5.17	108.9	14.48	17.29
1.2	15	2.74	1.174	0.23	5.18	112.4	12.13	17.29
1.6	20	2.63	1.179	0.21	5.19	118.2	8.66	17.29
2.0	25	2.57	1.173	0.20	5.17	124.3	7.49	17.29
2.4	30	2.52	1.175	0.19	5.17	124.9	6.48	17.29

JK

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] N Labeled with LOC ID [✓ Y] N Comments:
Sheen: Yes [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): [✓ VOC] [✓ SVOC] [✓ METHANE] [✓ IRON] [✓ SULFATE] [✓ METALS]
pH checked for ~~DRO~~ metals samples: [✓ Y] N Approximate HCl volume added (mL): 0

Purge Water

Gallons generated: 2.5 Containerized and disposed as IDW? [✓ Yes] No If No, why not?
Sampler's Initials: JK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form **Operable Unit 4** **Ft. Wainwright, Alaska**

Project #: 6033-40

Date: 11/6/15

Time: 1630

Sampler: JK

Weather: Cloudy/Snowing

QA/QC Sample ID/Time/LOCID:

Site Location: Landfill

Probe/Well #: AP-6530

Sample ID: 15FWOU4 22 WG

Outside Temperature: 29°F

MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 5 Turbidity Meter #: 12 Water Level: SOL 14

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product: 0

Column of Water in Probe/Well

Sampling Depth 6' screen

Total Depth in Probe/Well (feet btoc): 139.16

Depth to Water from TOC (feet): - 14.02

Column of Water in Probe/Well (feet): = 125.14

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 20.4

Well Screened Across [✓ Below] water table

Depth tubing / pump intake set* approx. 136.2 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	4.30	0.481	3.20	5.75	-73.7	5.89	14.05
0.8	10	3.98	0.481	2.13	5.68	-82.0	2.69	14.05
1.2	15	3.64	0.480	1.81	5.65	-81.6	2.51	14.05
1.6	20	3.48	0.479	1.63	5.68	-83.4	2.63	14.05
2.0	25	3.40	0.479	1.42	5.65	-82.7	2.59	14.05
2.4	30	3.39	0.479	1.32	5.67	-83.8	2.74	14.05
2.80	35	3.30	0.479	1.29	5.64	-83.8	2.67	14.05

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not? Well thawed using Heat Trace for 3 days, prior to sampling.

Did drawdown stabilize? [✓ Yes] No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] No If no, why not?

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock [✓ Y] / N Labeled with LOC ID [✓ Y] N Comments:

Sheen: Yes [✓ No] Odor: Yes [✓ No] Notes/Comments:

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ METHANE], [✓ IRON], [✓ SULFATE], [✓ METALS]

pH checked for ~~DRO~~ metals samples: [✓ Y] / N Approximate HCl volume added (mL): 0

Purge Water

Gallons generated: 3.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: JK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

15FW0U423WQ

Trip Blank

11/6/15 0800

VOC
Methane

Groundwater Sample Form **Operable Unit 4** **Ft. Wainwright, Alaska**

Project #: 6033-40
Date: 11/9/15
Time: 1350
Sampler: JK
Weather: Cloudy/snow
QA/QC Sample ID/Time/LOCID: —

Site Location: Landfill
Probe/Well #: AP-6532
Sample ID: 15FWOU4 24 WG
Outside Temperature: 26°F
MS/MSD Performed? Yes/ [✓ No]

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder
Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 5 Turbidity Meter #: 12 Water Level: Sol 14

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 173.70
Depth to Water from TOC (feet): - 14.92
Column of Water in Probe/Well (feet): = 158.78
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 25.9

Sampling Depth

Well Screened Across / [✓ Below] water table
Depth tubing / pump intake set* approx. 170 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	0.82	0.310	1.92	5.04	37.1	8.96	14.95
0.8	10	0.76	0.342	1.46	4.57	56.0	6.78	14.95
1.2	15	0.70	0.358	1.18	4.61	50.6	7.39	14.95
1.6	20	0.88	0.397	0.55	5.21	41.8	6.46	14.95
2.0	25	0.90	0.400	0.52	5.37	-6.1	6.18	14.95
2.4	30	0.97	0.401	0.50	5.40	-8.6	6.39	14.95
2.8	35	1.00	0.399	0.45	5.47	-13.9	6.49	14.95

JK

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not? Heat Trace used to thaw well for 4 Days prior to sampling.
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y]/N Labeled with LOC ID [✓ Y]/N Comments:
Sheen: Yes/ [✓ No] Odor: Yes / [✓ No] Notes/Comments:

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ METHANE], [✓ IRON], [✓ SULFATE], [✓ METALS]
pH checked for ~~DRO~~ metals samples: [✓ Y]/N Approximate HCl volume added (mL): —

Purge Water

Gallons generated: 3.0 Containerized and disposed as IDW? [✓ Yes]/ No If No, why not?
Sampler's Initials: JK Disposal method: [✓ Store at DERA Bldg] / Emerald Environmental / GAC treatment and surface discharge / other

Groundwater Sample Form **Operable Unit 4** **Ft. Wainwright, Alaska**

Project #: 6033-40

Date: 11/9/15

Time: 1510

Sampler: SK

Weather: Cloudy

Site Location: Landfill

Probe/Well #: AP6535

Sample ID: 15FWOU4 25 WG

Outside Temperature: 26°F

QA/QC Sample ID/Time/LOCID: 15FWOU426WG / 1530 / AP-4040

MS/MSD Performed? [✓ Yes] / No

Purge Method: [✓ Peristaltic Pump] / Submersible / Bladder

Sample Method: [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 5 Turbidity Meter #: 12 Water Level: SOL 14

Free Product Observed in Probe/Well? Yes/ [✓ No] If Yes, Depth to Product: Ø

Column of Water in Probe/Well

Sampling Depth 6' Screen

Total Depth in Probe/Well (feet btoc): 90.89

Well Screened Across / [✓ Below] water table

Depth to Water from TOC (feet): - 12.35

Depth tubing / pump intake set* approx. 87.9 feet below top of casing

Column of Water in Probe/Well (feet): = 78.54

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 12.8

Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

			At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
Field Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	0.84	0.465	1.15	5.35	4.9	36.00	12.37
0.8	10	1.30	0.468	0.99	5.85	-31.2	38.19	12.37
1.2	15	0.26	0.468	0.63	6.01	-40.8	36.03	12.37
1.6	20	0.99	0.467	0.39	5.82	-35.5	34.23	12.37
2.0	25	1.05	0.466	0.36	5.85	-37.3	34.11	12.37
2.4	30	1.08	0.467	0.34	5.88	-40.2	33.98	12.37

Did groundwater parameters stabilize? [✓ Yes] / No If no, why not? well thawed for 4 days

Did drawdown stabilize? [✓ Yes] / No If no, why not? using heat trace prior to

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not? sampling.

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock [✓ Y] N Labeled with LOC ID: [✓ Y] N Comments:

Sheen: Yes [✓ No] Odor: [✓ Yes] / No mild Notes/Comments:

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ METHANE], [✓ IRON], [✓ SULFATE], [✓ METALS]

pH checked for ~~DRO~~ metals samples: [✓ Y] N NA Approximate HCl volume added (mL): 0

Purge Water

Gallons generated: 2.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: SK Disposal method: Store at [✓ DERA] Bldg / Emerald Environmental / GAC treatment and surface discharge / other

15FW0U427WQ

Trip Blank

11/9/15 0800

VOC
Methane

YSI Calibration Form

Operable Unit 4, Ft. Wainwright

Name: CB JK

2015

Calibration Liquid Lot Numbers/ Expiration Dates:

SPC	ORP	Ph 4	~~Ph 7 or~~ Ph 10
13K100151 4/2015	6237 6/18	RT1 / 5/15	RV1 5/15

Date	Project	YSI# / Turbidity #	Bar. PSI mmHg	D.O . Pre	D.O . Post	SPC Pre	SPC Post	ORP Pre	ORP Post	Ph 4 Pre	Ph 4 Post	Ph 7 Pre	Ph 7 Post	Calibrate Turbidity Meter (Y/N)
4/6	OU4 LF	9/12	747.9	9.9	10.38	1.006	1.000	229.8	240	4.13	4	6.98	7	Y
4/7/15	OU4	6/13	731.0	10.73	9.86	0.992	1.000	237.3	240.0	4.08	4.00	6.98	7.00	Y
4/8/15	OU4	6/13	736.0	9.96	8.83	1.001	1.000	237.6	240.0	3.96	4.00	7.00	7.00	Y
4/8/15	OU4	9/12	739.1	10.28	9.51	1.009	1.000	229.8	240	4.04	4	7.05	7	Y
11/6/15	OU4 JK	5/12	737.8	8.80	9.06	1.414	1.413	243.3	240.0	4.05	4.00	7.33	7.00	Y
11/7/15	OU4 JK	5/12	750.4	9.40	9.48	1.422	1.413	250.9	240.0	3.96	4.00	6.93	7.00	Y
11/9/15	OU4 JK	5/12	744.6	9.24	9.33	1.006	1.000	235.6	240.0	3.95	4.00	6.91	7.00	Y

Notes/ Maintenance Items:

FIELDBOOK ENTRY ITEMS

- →Project Name
- →Date, Time, and Location Activities Take Place
- →Names and Affiliations of Personnel Onsite
- →Field Observations / Site Conditions and Comments
- →Weather Conditions
- →Rationale for Sampling Locations
- →Rationale for any Changes to Sampling Protocol
- →Site Sketches
- →Health and Safety Comments
- →Conversations with the USACE or Other Involved Parties
- →Field Instrument Calibration Documentation
- →Record of Sampling Activities
- →Problems Encountered in the Field and Corrective Actions

Item No. 393N
ISBN: 978-1-932149-91-3

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ALL-WEATHER
JOURNAL
№ 393N

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907-378-4630
CHRIS@FESALASKA.COM

FT. WAINWRIGHT

2015

PREP ITEMS INCLUDE:

→Talk to Project Manager(s) about Progress
→Load Van with Necessary GWS Gear/Sample Kits/Ice
→Print Necessary Forms
→Calibrate YSI, Turbidity Meters, etc.
→Dump and Refill Decon/Rinse Water Buckets
→Rotate Cooler Ice
→Develop and Implement Days Plan
→Drive to site

CLEAN UP/END OF DAY ITEMS INCLUDE:

→Talk to Project Manager(s) about Progress
→Dump Trash
→Clean YSI Probes
→Rotate Ice in Sample Coolers
→Clean Field Vehicle
→Charge Peristaltic Pump/Submersiable Pump Batteries
→Finish / Sign Fieldbook Entries
→Drive Back to Shop / Hotel
→Check / Add HCl to DRO Samples
→
→

Rite in the Rain
ALL-WEATHER WRITING PAPER

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Project

Rite in the Rain – A patented, environmentally responsible, all-weather writing paper that sheds water and enables you to write anywhere, in any weather. Using a pencil or all-weather pen, *Rite in the Rain* ensures that your notes survive the rigors of the field, regardless of the conditions.

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OU4 FT. WAINWRIGHT

4/6/15

0800 - SHOP - GWS PREP + PREP TO THAW AP-6532 WITH HOTSIE. 1100 - PICK UP FITTING AT AK RUBBER FOR HOTSIE HOSE. 1114 - FUEL VAN AT FM. 1200 - LUNCH. 1240 - MEET JK AT LANDFILL - THAW AP-6532 TO 1715 - USED ~30 GALLONS THEN REMOVED 45 GALLONS OF CLEAN WATER. 1725 LEAVE SITE. 1735 - SHOP - CLEAN UP. 1800 - END OF DAY. NOTE WEATHER WAS CLOUDY 30-40°F. HAD PLANNED ON SAMPLING, BUT HOTSIE THAWING WAS 2 PERSON JOB ALL DAY WITH SNOW / HOTSIE TRANSPORT.

4/7/15

0745 - ON SITE - CALIBRATE DO ON YSI 9 (NOTE: DIDNT DO FULL CALIBRATION BECAUSE DID NOT SAMPLE ON 4/6/15. 0855 - SAMPLE FWLF-4 - 15FWOU401WG. 1055 - SAMPLE AP-6138 - 15FWOU403WG. 1210 - SAMPLE AP-8061 15FWOU405WG. 1230 - LEAVE SITE - 1245 FILL GAS CANS AT FM (FOR UTV) - LUNCH TO 1335 1420 - SAMPLE AP-5588 - 15FWOU407WG & DUPLICATE 15FWOU408WG AT 1535. 1645 - SAMPLE AP-5589 - 15FWOU409WG. CLEAN UP 1710 - LEAVE SITE. 1730 - SHOP - CLEAN UP. 1800 - END OF DAY.

4/8/15
0800 - SHOP - GWS PREP(OU4)
0937 - ON SITE 1120 -
GWS AP-10259MW + MSMSD
+ DUP - 15FWOU413WG /
15FWOU414WG. 1325 - GWS
AP-10258MW - 15FWOU408WG.
AND AP-10257MW -
15FWOU415WG AT 1440.
1500 - CLEANUP / LEAVE
SITE. 1520 - SHOP - CLEAN
UP. TO 1800 - START ON
COC + PRE PACKING FOR
4/9/15. Ch Boise

OU4 - 2015

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Task: 6033-40

Josh Klynstra

4/1/15 P. Cloudy 36°F

1700 - Prepare gear for Thawing Wells @ the Landfill

- check generators
- assemble - power cords
  - lockes
  - cables
  - fuel jugs
  - propane tanks
- hook up to trailer
- load UTV

→ Check on availability of generators for rent.

End Day 1800

2 4/2/15 Overcast 22°F

0630 - Prepare for placing generators.

0800 leave office
→ fill propane @ CPD
→ fuel truck & fuel jugs

0930 - Arrive on site with rental generators and unload utv.
→ set generators in place and run.

1021 - generators set.
→ the rental 1700 is not strong enough to run the heat trace and will have to be exchanged for a 3800 since they don't have any 2500 generators available

1030 - leaving project till later.

1130 - Return 1700 generator and get another 3800.

1/3

4/2/15 Overcast 29°F

1206 - arrive back @ OU4 and set generator @ AP-8063

1223 - Generator running @ 8063
→ load up ~~go~~ UTV and leave Landfill site.
Leaving @ 1230

1815 - Arrive @ OU4 Landfill to Refuel Generators.
→ It is snowing lightly and the Temp has risen to 30°F

1910 - Generators Refueled
*Note: found that the heat-trace in AP-6532 is not thawing. It has tripped the breaker on the generator and continues to do so. may have to use the hotsie to thaw the well and introduce a new strand of heat trace

2/3

4/2/15 Overcast 30°F

1945- Park trailer infront of the shop and park the flatbedinside.

End Day @ 1945

JK

3/3

4/3/15 Clear 19°F

0630 - Collect Hotsie and other gear to thaw well AP-6532

end project @ 0730

0850-drive to BHPR to locate Hotsie hose.

0920- purchace new heat trace and have a plug end put on it.

0940- Hook up to trailer and go to refuel generators.

1144 - new heat trace purchaced
→ 3 generator re fueled.
→ 1 generator (rental 3800) picked up. will use hotsie to thaw -6532

leaving project @ 1200

1/2

4/3/15 P.Cloudy 34°F

1715 - Return to OU4 to refuel the generators and check to see that there is no ice lense in any of the other wells we sample.

1930 - completed @ site for today. Shoveled snow from around most wells

Leaving site to fuel the truck and a couple fuel jugs

End Day @ 2015

SK

2/2

4/4/15 Overcast 25°F

0700 - Drive to site ~~@~~ after doing a vehicle inspection.

0740 - Refueling generators @ AP-8063 and AP-6530

→ Propane generator @ AP-6535 is still running. will need to fill the spare and exchange it later today.

0830 - leaving project for now.

1630 - leaving OU3 ROLF to refill the fuel jugs and the propane bottle.

1650 Arrive at OU4 to refuel
~~1700 - A~~ Generators

1700 - UTV unloaded and ready to go.

1730 - leaving site.

End Day @ 1800

4/5/15 - P. Cloudy 16°F

0730 - Drive to Landfill site.
→ Vehicle inspection/walkaround.

0751 - arrive @ site and unload UTV.

0830 - leaving Landfill site.

1800 - Drive to site for another refueling cycle.

1817 - Arrive @ Old 4 site.

1924 - Propane generator was not running and upon restart gave the "oil alert" message ~~but to~~ called CB and picked up some oil from him.
→ Generator is now running.

Leaving site

End day @ 2000 JK 1/1

4/6/15 Overcast 26°F

0610- Drive to ROLF to pick up the 100 gallon water tank for the hotsie.
→ Do vehicle walkaround for the flatbed/trailer

0700- Return to the shop and prepare gear for thawing AP-6532 w/ the hotsie.

→ Arrive @ the shop and prepare gear for today

0800- leave this task to work on a separate task

0900- connect the end to the bare heat trace.
- load water tank and fill
- load Hotise & hose into Trailer
- fill propane & fuel jugs.

1200-arrive @ ~~ROLF~~ Landfill site.

4/6/15 Sunny 45°F

1210- contact CB for estimate of time he will arrive.

→ make a run out to fuel generators and drop off a load of gear @ the well for thawing.

1515 → when I arrived back @ the truck Chris was there

↳ load up the hotsie and drag out to well.

↳ we were able to thaw the well down and remove the old heat-trace

↳ plan is to pump out the 30 or so gallons that we pumped into the well for thawing. if the well recharges then we have reached the screen. if it does not then we need to figure out why.

2/3

4/6/15 Overcast 45°F

1610 - 45 gallons removed from AP-6532. after measuring WL @ 17.42 well drew down to 18.60 @ 43 gallons purged.

1940 - Generators refueled for another night.

→ UTV loaded and purge water labeled.

→ Leaving Site.

1800 → arrive @ shop and take propane bottle out of truck.

End Day @ 1815

JK

3/3

4/7/15 overcast 28°F

0630- Calibrate YSI
↳calibrate Turbidimeter #13
↳prep other sampling gear.

0830- leaving the office for the Landfill

0900- Arrive @ Landfill and prepare gear
→check in w/ CB @ FWLF-4 and deliver my gear to AP-6532.
→return to truck and help move CB to AP-6138.

1012- Begin purging AP-6532.

1115- completed sampling AP-6532
→move to AP-6535 and remove the generator to the trailer.
1200- set up to sample AP-6535.

1320- Completed collecting sample @ AP-6535.

1/3

4/7/15 Overcast 42°F

1320 - move to AP-8061' to pick up CB's gear to AP-5588

1335 - Return to AP-6535 and move gear to AP-6530.

1520 - Completed w/ AP-6530
→ Demob and check in w/ CB

1536 - Measure WL @ Cat Shed wells and others that will be sampled tomorrow to get a consistant round of WL

AP-10259 MW - 19.57
AP-10258 MW - 19.17
AP-10257 MW - 19.62
AP-8063 - 17.31
AP-6136 - 19.70

1630 - arive @ AP-5588 to assist CB in demob from OU4.

1710 - UTV loaded. leaving OU4. 2/3

4/7/15 Overcast 45°F

1730 - Unload UTV and park in the shop.

→ store samples in the fridge

→ scan gw forms and put in the binder

→ decon gear.

End Day @ 1815

JK

3/3

4/8/15 P. Cloudy 25°F

0715 - Arrive @ shop and calibrate YSI/Turbidimeter
→ prep gear & sample kit

0810 - load UTV into trailer and complete vehicle walkaround
↳ Drive to Landfill site.

0900 - Realized that I forgot to bring my flow through cell
↳ check to see if it is in the truck.

0930 - Called CB to see if he can bring one to me from the shop.

1000 - CB arrived @ OU4 w/ the flowthroughcell
→ Begin sampling AP-8063

1100 - Begin collecting samples.

4/8/15 J. Clouky

1200 - Completed collecting 8063.
↳ MS/MSD/Dup

1220 - move to next well.
→ set up to sample AP-6136

1350 - Paramaters stabalized
↳ begin collecting sample.

1500 - Sampling completed.
Rental Generator collected from AP-8063, and ready to return.
→ leaving site.

1530 - arrive @ office after returning generator.
→ unload UTV and park
→ unhook and lock trailer
→ clean out truck
→ store samples in the fridge

End Day @ 1630
JK

2/2

11/13/15 P. Cloudy 20°C

0630 - prep gear for OU4 well thawing.

0800 - leave shop to get fuel and to rent a generator.

0900 - arrive @ BHPR to park trailer
↳ load gear into UTV and drive to Landfill site.

1100 - Generators installed at wells.
↳ will have to do some tree removal due to fallen trees blocking some of the trails

1200 - leaving project
↳

1430 - grab chainsaw and return to BHPR

1500 - refuel generators ✓

1/3/15 P. Cloudy 25°F

1545- 2.5K generator is not restarting. Clear trees and come back to it.

1615- able to get rental 2.5K gen. going again

1700- several trees cleared. will do more tomorrow.

1730- leaving site.

JK

2/2

10/4/15 Cloudy 20°f

0700- Drive to site to refuel generators.

0730- arrive @ BHPR

1000- removed a few trees and refueled generators @ 6530 & 6532
→ propane generator @ 6535 is still going

1015- leaving site.

↳ Stop by home depot to get a new chain.

1100- leaving project

1500- return to site

1715- leaving site after refueling generators.
↳ new propane @ 6535

End Day @ 1730

11/5/15 Clear 20°F

0700- Drive to BHPR

0900- leaving site.
↳ rental gen continues to not run. This is the 3rd time it still has fuel in the tank.
↳ will have to make extra trips out to check it.

0930- Pick up a new chain for the chainsaw.

1000- prep GW gear for sampling tomorrow

1230- Return to site to check the rental Generator.

1346. rental not running.
↳ take it back to exchange.

1445- arrive back on site

1/2

11/5/15 Cloudy 30°F

1515 - generator re-installed
↳ stop by the landfill and check in for sampling tomorrow

1545 - leave project

1715 - make a quick check of the gen's. to make sure all is well.

1750 - UTV locked up for the night
↳ all 3 generators are running.
↳ leav site.

End Day @ 1815

JK 2/2

11/6/15 Snow 27°F

0715- Calibrate YSI & Turbi

0750- fuel van and proceed to BHPR to refuel generators.

0820- arrive @ BHPR

0900- generators fueled.
↳ Propane generator shut off to allow the well to normalize
↳ set up to sample AP-8061

1026- completed sampling AP-8061!
↳ return to BHPR to get the Van. Move to CAT shed to sample AP-10258MW

1050- set up @ AP-10258MW

1215- move to set up @ AP-10257MW

11/6/15 Snowing 29°F

1445- move to BHPR to transfer gear into the UTV and proceed to AP-6535

1520- failed to check for tubing in the wells prior to this moment and found that AP-6535 and 6532 do not have tubing in them.
↳ will check -6530.
if there is none then I will sample tomorrow.
→ turned gen. on @ 6535 and refueled 6532.

1530- AP-6530 had tubing. will sample well.
↳ Generator was off and breaker tripped/ heat trace was cold on arival

1640- completed sampling 6530
↳ Demob from site
End Day @1730 2/2

11/7/15 Snowing 30°F

0630- calibrate YSI/Turbi

0710- arrive @ BAPR
↳ mob. to AP-6532 to sample.

0800- setup and install tubing into AP-6532.

0910- move to AP-6535 to install tubing.

1020- completed sampling AP-6535
↳ demob to trailer/van.
↳ Return to collect generator and return the rental

1230- bring gear & samples back to the office.
↳ park the trailer in the shop to thaw it out.

End Day @ 1400.

JK 1/1

11/9/15 Cloudy 26°F

0715 - complete the COC and pack samples.

1010 - will need to resample AP-6532 and 6535/ms/msD

1150 - arrive @ OU4 landfill site.
↳ load gear into UTV and proceed to the wells.

1215 - set up to sample @ AP-6532
↳ forgot flex tubing → return to van to get some

1230 - stopped and installed tubing in AP-6535 on the way back to the van to make sure it was still free of ice.
↳ since it was I left the gen. @ the van

1240 - begin purging AP-6532

1/2

11/4/15 Cloudy 26°C

1400 - move to AP-6535 to collect the MS/MSD and the Duplicate.

1530 - completed sampling @ AP-6535 → Demob from the site.

1600 - leaving site.

1700 - Trailer parked in the shop to store samples in the fridge.

End Day @ 1915

SK 2/2

APPENDIX B

CHEMICAL DATA QUALITY REVIEW, ADEC CHECKLISTS, AND SUPPORTING INFORMATION

FINAL
CHEMICAL DATA QUALITY REVIEW

Operable Unit 4 Landfill Report (2015)

Fort Wainwright, Alaska

NPDL # 15-035

Prepared: February 8, 2016

Prepared for and Under Contract to

Army Corps of Engineers - Alaska District

Prepared by

Fairbanks Environmental Services, Inc.

I certify that all data quality review criteria described in Section 1.1 were assessed, and that qualifications were made according to the criteria outlined in the Operable Unit Sites Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP).

____

Vanessa Ritchie
Project Chemist

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska
B	analytical result is qualified as a potential high estimate due to contamination present in a blank sample
°C	degrees Celsius
CCV	continuing calibration verification
CDQR	Chemical Data Quality Review
COC	contaminant of concern
CoC	chain-of-custody
DL	detection limit
DoD	United States Department of Defense
DQO	data quality objective
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
ERA	Environmental Resource Associates
FES	Fairbanks Environmental Services, Inc
ICV	initial calibration verification
J	The analyte is considered an estimated value. The analyte may be estimated due to its quantitation level (≥ DL and < LOQ), or it may signify that there is a QC deviation and the bias is unknown
J+	The analyte is considered an estimated value with a high-bias due to a QC deviation
J-	The analyte is considered an estimated value with a low-bias due to a QC deviation
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
µg/L	micrograms per liter
mg/L	milligrams per liter
MS	matrix spike sample
MSD	matrix spike duplicate sample
NA	not applicable
ND	the analyte was analyzed for, but not detected
NPDL	North Pacific Division Laboratory
OU4	Operable Unit 4
PE	performance evaluation
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories
R	Analyte result is rejected because of deficiencies in meeting QC criteria and may not be used for decision making
RF	response factor
RPD	relative percent difference

LIST OF ACRONYMS AND ABBREVIATIONS – continued

SDG	sample data group
SOP	standard operating procedure
SVOC	semi-volatile organic compounds
TAL	TestAmerica Laboratories, Inc
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
VOC	volatile organic compounds

1.0 INTRODUCTION

This Chemical Data Quality Review (CDQR) summarizes the technical review of analytical results generated in support of groundwater sample collection at the Operable Unit 4 (OU4) sites during 2015. The groundwater events are summarized in Section 1.3. Groundwater sample tracking and analytical results tables are presented in Appendix C.

Fairbanks Environmental Services, Inc (FES) reviewed project and quality control (QC) analytical data to assess whether the data met the designated quality objectives and were acceptable for project use. The project data were reviewed for deviations to the requirements presented in the 2014 Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2014), the Alaska Department of Environmental Conservation (ADEC) Technical Memo 06-002 (ADEC, 2009), and the United States Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.0 (DoD, 2013). The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess contamination), project sample and laboratory quality control sample duplicates (to assess precision), laboratory control samples (LCSs) and sample surrogate recoveries (to assess accuracy), and matrix spike sample (MS) recoveries (to assess matrix effects). Calibration curves and continuing calibration verification recoveries were not reviewed unless a QC discrepancy was noted by the laboratory in a case narrative. In many cases, QC deviations that do not impact data are not discussed in this CDQR. More elaborate data quality descriptions are reported in the ADEC Laboratory Data Review Checklists, which are included at the end of Appendix B.

Groundwater limits of detection (LODs) for non-detect results were compared to cleanup levels presented in Title 18 of the Alaska Administrative Code (AAC) Chapter 75, Table C (ADEC, 2016).

Groundwater data quality is discussed in Section 2. Applicable data quality indicators are discussed for each method under separate subheadings. Data which did not meet acceptance criteria have been described and the associated samples and data quality implications or qualifications are summarized. All cited documents within the CDQR are listed in Section 3.

1.1 Analytical Methods and Data Quality Objectives

The analytical methods and associated data quality objectives (DQOs) used for this review were established in the UFP-QAPP (FES, 2014). The DQOs represent the minimum acceptable QC limits and goals for analytical measurements and are used as comparison criteria during data quality review to determine both the quality and usability of the analytical data. Table B-1 on the following page summarizes the analytical methods employed, and the associated DQO goals, for groundwater samples.

Table B-1 – Groundwater Analytical Methods and Data Quality Objectives

Parameter[1]	Preparation Method	Analytical Method	Limit of Detection	Accuracy[2] (%)	Precision[2] (RPD, %)	Completeness (%)
Benzene	SW5030B	SW8260C	1.0 µg/L	79-120	20	90
cis-1,2-Dichloroethene			0.50 µg/L	78-123	20	90
1,1,2,2-Tetrachloroethane			0.50 µg/L	71-121	20	90
1,1,2-Trichloroethane			0.50 µg/L	80-119	20	90
Vinyl Chloride			0.50 µg/L	58-127	20	90
Trichloroethene			1.0 µg/L	79-123	20	90
bis(2-Ethylhexyl) Phthalate	SW3520C	SW8270D	2.0 µg/L	55-135	20	90
Methane	RSK-175		0.37 µg/L	73-125	20	90
Metals	SW3005A	SW6020A	Analyte Specific[3]	Analyte Specific[3]	20	90
Iron	SW3005A	SW6010C	0.36 mg/L	87-115	20	90
Sulfate	E300.0		0.50 mg/L	90-110	15	90

[1] The full suite of VOCs and SVOCs were analyzed, but only OU4 contaminants of concern are show here. DQOs for other VOCs and SVOCs are presented in the UFP-QAPP (FES, 2014).
[2] Precision and accuracy are for LCS and MS samples.
[3] Analyte-specific LODs are presented in the UFP-QAPP (FES, 2014).
µg/L – micrograms per liter
mg/L – milligrams per liter
RPD – relative percent difference

The six DQOs used for this review were accuracy, precision, representativeness, comparability, sensitivity, and completeness.

- *Accuracy* measures the correctness, or the closeness, between the true value and the quantity detected. It is measured by calculating the percent recovery of known concentrations of spiked compounds that were introduced into the appropriate sample matrix. Surrogate, LCS, and MS sample recoveries were used to measure accuracy for this project. LCS and surrogate recovery criteria are defined in the QSM.
- *Precision* measures the reproducibility of repetitive measurements. It is measured by calculating the relative percent difference (RPD) between duplicate samples. Laboratory duplicate samples, field duplicate samples, MS and matrix spike duplicate sample (MSD) sample pairs, and LCS and laboratory control sample duplicate (LCSD) pairs were used to measure precision for this project. LCS/LCSD precision criteria are defined in the QSM and field duplicate precision criteria are defined in the ADEC Laboratory Data Review Checklist (water: ≤30%).

- *Representativeness* describes the degree to which data accurately and precisely represents site characteristics. This is addressed in more detail in the following section(s).
- *Comparability* describes whether two data sets can be considered equivalent with respect to the project goal. This is addressed in more detail in the following section(s).
- *Sensitivity* describes the lowest concentration that the analytical method can reliably quantitate, and is evaluated by verifying that the detected results and/or LODs meet the project-specific cleanup levels and/or screening levels.
- *Completeness* describes the amount of valid data obtained from the sampling event(s). It is calculated as the percentage of valid measurements compared to the total number of measurements. The completeness goal for this project was set at 90 percent.

In addition to these criteria for the six DQOs described above, sample collection and handling procedures and blank samples were reviewed to ensure overall data quality. Sample collection forms were reviewed to verify that representative samples were collected and samples were without headspace (if applicable). Sample handling was reviewed to assess parameters such as chain-of-custody (CoC) documentation, the use of appropriate sample containers and preservatives, shipment cooler temperature, and method-specified sample holding times. Blank samples were analyzed to detect potential field or laboratory cross-contamination. Each of these parameters contributes to the general representativeness and comparability of the project data. The combination of evaluations of the above-mentioned parameters will lead to a determination of the overall project data completeness.

1.2 Data Qualifiers

Table B-2 outlines general flagging criteria used for this project, listed in increasing severity, to indicate QC deficiencies. Data are qualified pursuant to findings determined in the review of project data.

Table B-2 – Data Qualifier Definitions

Qualifier	Definition
ND	The analyte was analyzed for, but not detected at the DL.
J	The analyte is considered an estimated value. The analyte may be estimated due to its quantitation level (≥ DL and <LOQ), or it may signify that there is a QC deviation and the bias is unknown.
J+	The analyte is considered an estimated value with a high-bias due to a QC deviation.
J-	The analyte is considered an estimated value with a low-bias due to a QC deviation.
B	The analyte is detected in an associated blank. Result is less than 5x or 10x (for the common lab contaminants) the concentration. Therefore, the result may be high-biased.
R	Analyte result is rejected because of deficiencies in meeting QC criteria and may not be used for decision making.

1.3 Summary of Groundwater Samples

A total of 16 groundwater samples were collected from monitoring wells associated with the Landfill source area, consisting of 14 project samples and 2 field duplicate samples. A total of 7 groundwater samples were collected from the monitoring wells associated with the leach field at the CAT Shed (Building 1191), consisting of 5 project samples and 2 field duplicate samples. Extra sample volume was collected for MS/MSD samples for every analysis at both the Landfill source area and the leach field. In addition, one trip blank sample accompanied each cooler containing samples for volatile analyses, and one performance evaluation (PE) samples was submitted blindly with project samples. The collection of an equipment blank sample was not required as samples were collected with a peristaltic pump employing dedicated Teflon-lined tubing at each monitoring well. Samples were analyzed by the methods presented in Table B-1.

All project and QC samples were analyzed by TestAmerica Laboratories, Inc (TAL) of Seattle, Washington, with the exception of methane, which were subcontracted to TAL of Denver, Colorado for analysis. The laboratories are validated by the State of Alaska through the Contaminated Sites Program and are certified through the Environmental Laboratory Accreditation Program (ELAP) for the applicable methods employed for this project. In addition, TAL is compliant with the DoD QSM, Version 5.0 (DoD, 2013), for applicable methods.

All samples were shipped in three sample data groups (SDGs) and assigned the TAL report numbers 580-48876, 580-54924, and 580-55009. A sample tracking table (Table C-1) and an analytical results table (Table C-2) are included in Appendix C. Groundwater sample data quality is discussed in Section 2.

2.0 GROUNDWATER DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications for groundwater samples. All samples were analyzed by TAL and are included in three SDGs (580-48876, 580-54924, and 580-55009). See the associated ADEC Laboratory Data Review Checklists, located at the end of Appendix B, for more elaborate data quality descriptions.

2.1 Sample Collection

Groundwater sample collection forms were reviewed to ensure that well drawdown and groundwater parameters met the stabilization criteria identified in the ADEC Draft Field Sampling Guidance (ADEC, 2010) and the UFP-QAPP (FES, 2014), that all parameters met the low-flow sampling criteria (Puls and Barcelona, 1996), and that all groundwater levels were within the screened intervals at the time of sampling. All samples met stabilization criteria and all water levels were within the screened interval during sample collection, with the exception of those noted below. No free project was measured.

- All groundwater levels were within the screened intervals of the shallow-screened monitoring wells during sample collection. However, the groundwater levels were above the screened intervals in the intermediate- and deep-screened wells. These wells were purposely screened below the water table to investigate contaminants associated with different depths.
- All deep-screened wells required thawing prior to sampling as they are set in permafrost. Dedicated heat trace cable is installed in each well. A generator is used to power the cable and thaw the ice, which typically takes 3 to 4 days.
- The dedicated heat trace in well AP-6532 failed, so steam was used to thaw the well for the spring sampling event. A total of 30 gallons of potable water was injected into the well during the thawing process and a total of 48 gallons were purged from the well prior to sample collection. Impact to the sample data is likely negligible as the results are consistent with historic results for this well. New dedicated heat trace was installed following the spring event.

When applicable, groundwater samples were inspected in the field, as well as upon receipt at the laboratory, to ensure sample vials did not contain headspace. No headspace discrepancies were noted during sample collection or by the laboratory upon sample login.

An equipment blank sample was not collected since a peristaltic pump was employed to collect samples and dedicated Teflon-lined tubing was used at every monitoring well.

2.2 Sample Handling

The evaluation of proper sample handling procedures included verification of the following: correct COC documentation, appropriate sample containers and preservatives, cooler temperatures maintained at 4 degrees Celsius (°C) (±2 °C), and sample analyses performed within method-specified holding times. The following discrepancies were noted upon receipt at the laboratory.

Temperature Discrepancies

- Coolers 040902, 040903, and 040904 (report 580-48876); 110901, 110902, and 110903 (report 580-54924); and 111001 and 111002 (report 580-55009) arrived at the laboratory with temperature blanks reading below the recommended range. Since the samples were reportedly received in good condition and the temperatures were above freezing, no data were qualified.

Broken Containers

- One of two amber bottles for SVOC sample 15FWOU414WG was received at the laboratory broken (report 580-48876). The analysis was performed as requested on the remaining bottle, so no data were impacted.

Holding Time Discrepancies

- One VOC sample (15FWOU422WG; batch 206259) and five SVOC samples (15FWOU418WG through 15FWOU422WG; batch 208232) were re-extracted and re-analyzed 3 and 32 days outside of method holding times, respectively, due to QC issues associated with the initial runs report 580-54924). Since the initial runs were performed within holding time, these results are reported as primary and were qualified as appropriate due to QC discrepancies, as discussed in the following sections. In all but one case discussed on the in the following sub-bullet, the results of the two runs are similar (most analytes are non-detect with a few at trace concentrations of one to five orders of magnitude less than ADEC cleanup levels).
    - The results of the VOC and SVOC initial and re-analysis runs are similar, with the exception of the bis(2-ethylhexyl)phthalate results for field duplicate sample 15FWOU421WG. The result in the initial run exceeded the ADEC cleanup level (6 µg/L) at a concentration of 14 µg/L, and the result from the re-analysis run was non-detect (LOD = 2.2 µg/L). The bis(2-ethylhexyl)phthalate results of the initial and re-analysis runs for the primary sample (15FWOU420WG) were both non-detect. Since bis(2-ethylhexyl)phthalate has not previously exceeded the cleanup level in this well (AP-10257MW), and since both results for the primary sample were non-detect, it is assumed that the elevated concentration of the field duplicate sample from the initial run is erroneous. However, the results from the initial run are reported as primary as the samples from the re-analysis were extracted 32 days outside of holding time. Moreover, a high-biased LCS recovery of bis(2-ethylhexyl)phthalate is associated with the initial analytical batch, which further suggests that the bis(2-ethylhexyl)phthalate result for 15FWOU421WG is high-biased. Consequently, the result was qualified (J+), as further discussed in Section 2.4 (first bullet).
- VOC sample 15FWOU426WG was analyzed 1 day outside of holding time. Consequently, all VOC results for sample 15FWOU426WG were qualified (J-) as potential low estimates. Impact to data is negligible as sample 15FWOU426WG is a field duplicate of sample 15FWOU425WG (which was analyzed within holding time) and all VOC analytes met the field duplicate comparison criteria of 30% RPD. See Section 2.7 for field duplicate data comparisons.

- The MS/MSD analysis performed on VOC sample 15FWOU425WG was also analyzed 1 day outside of holding time (note that sample 15FWOU425WG was initially analyzed within holding time and reanalyzed 1 day outside holding time with its corresponding MS/MSD, and that both sets of results from the parent sample are comparable). Since the results of the parent sample are reported for the analysis performed within holding time, no qualification due to holding time was warranted.

2.3 Blanks

Method blanks and trip blanks were utilized to detect potential cross-contamination of project samples. Method blanks detect laboratory cross-contamination and trip blanks assess shipment and storage cross-contamination. A trip blank accompanied every cooler containing samples for volatile analyses. The following blank contaminations were noted.

Method Blanks

The following analytes were detected in method blank samples at a concentration less than the limit of quantitation (LOQ), and were also detected in associated project samples within five times the concentration detected in the method blank (or ten times the concentration for common laboratory contaminants). Consequently, these analytical results were qualified (B) as potential laboratory cross-contamination. In all cases, impact to data quality was minor as the affected results were below the applicable groundwater cleanup levels. Method blank contamination that did not result in data qualification is discussed in associated ADEC Laboratory Data Review Checklists.

- The 8260C analytes bulleted below were detected in method blank samples associated with three reports. The associated project samples that were qualified (B) due to method blank detections are also presented below. The associated QC batches are identified in the ADEC Laboratory Data Review Checklists.
    - carbon disulfide: 15FWOU426WG (report 580-55009)
    - m&p-xylenes: 15FWOU426WG (report 580-55009)
    - methylene chloride: 15FWOU401WG through 15FWOU407WG, 15FWOU409WG, and trip blank sample 15FWOU417WQ (report 580-48876); trip blank sample 15FWOU423WQ (report 580-54924); and 15FWOU426WG (report 580-55009)
    - naphthalene: 15FWOU418WG, 15FWOU420WG, and trip blank sample 15FWOU423WQ (report 580-54924)

- The 8270D analytes bulleted below were detected in method blank samples associated with two reports. The associated project samples that were qualified (B) due to method blank detections are also presented below. The associated QC batches are identified in the ADEC Laboratory Data Review Checklists.
    - benzyl butyl phthalate: 15FWOU421WG (report 580-54924)
    - di-n-butyl phthalate: 15FWOU421WG (report 580-54924)

   - diethyl phthalate: 5FWOU418WG through 15FWOU422WG (report 580-54924); and 15FWOU424WG (report 580-55009)

<u>Trip Blank</u>

The following analytes were detected in trip blank samples at a concentration less than LOQ, and were also detected in associated project samples within five times the concentration detected in the trip blank (or ten times the concentration for common laboratory contaminants). Consequently, these analytical results were qualified (B) as potential cross-contamination. In all cases, impact to data quality was minor as the affected results were below the applicable groundwater cleanup levels. Method blank contamination that did not result in data qualification is discussed in associated ADEC Laboratory Data Review Checklists.

- Methylene chloride was detected in trip blank samples 15FWOU417WQ (report 580-48876) and 15FWOU423WQ (report 580-54924); however, the detections were associated with laboratory cross-contamination, as discussed in the Method Blank section above. No further qualifications were applied.
- Methylene chloride and naphthalene were detected in trip blank sample 15FWOU427WQ (report 580-55009). Both methylene chloride and naphthalene were detected in associated sample 15FWOU426WG. However, the methylene chloride detected in sample 15FWOU426WG was also detected in the associated method blank sample, thus the result was qualified in Method Blank above. No further methylene chloride qualifications were applied due to the trip blank detection. Naphthalene was detected in sample 15FWOU426WG at a concentration within five-times that of the trip blank sample and was consequently qualified (B) as potential cross-contamination. Impact to the project was negligible as the affected datum is approximately three orders of magnitude less than the ADEC cleanup level.

2.4 Laboratory Control Samples

The LCS/LCSD samples were prepared by adding spike compounds to blank samples in order to assess laboratory extraction and instrumentation performance. The performance of a LCS sample is a requirement for every QC batch to evaluate recovery accuracy. In addition, a LCSD is required for all Alaska fuel methods to evaluate batch precision. For QC batches that do not contain a LCSD, precision is evaluated by performing a sample duplicate, which is further discussed in Section 2.5.

All LCS and/or LCSD samples were performed, as required. The accuracy of analyte recoveries for LCS samples, and precision of the LCS/LCSD sample pair (when applicable), was evaluated. Accuracy and precision discrepancies that resulted in data qualification are listed below; discrepancies that did not result in data qualification are only discussed in the associated ADEC Laboratory Data Review Checklists. Moreover, values of percent recoveries and RPDs are compared to control limits in the ADEC checklists.

- The SVOC LCS and/or LCSD sample contained in extraction batch 205525 recovered outside control limits for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-54924). Low recoveries were noted for 4-nitroaniline, 4,6-dinitro-2-methylphenol, anthracene, 3,3′-dichlorobenzidine, 2,4-dimethylphenol, 4-chloroaniline, hexachlorocyclopentadiene, and 3-nitroaniline. All results for 3,3′-dichlorobenzidine and 4-chloroaniline in associated samples (15FWOU418WG through 15FWOU422WG) were rejected (qualified "R") due to recoveries below 10%. Neither analyte is a site contaminant of concern so impact to the project is negligible. The remaining aforementioned analytes (4-nitroaniline, 4,6-dinitro-2-methylphenol, anthracene, 2,4-dimethylphenol, hexachlorocyclopentadiene, and 3-nitroaniline) were qualified (J-) in associated samples (15FWOU418WG through 15FWOU422WG) as potential low estimates; however, impact to the project is negligible as the results are either non-detect with LODs two to five orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. High recoveries were noted for butyl benzyl phthalate and bis(2-ethylhexyl)phthalate. Consequently, detected analytes were qualified (J+) as high estimates in associated project samples, which included the butyl benzyl phthalate result for sample 15FWOU421WG and the bis(2-ethylhexyl)phthalate result for samples 15FWOU421WG and 15FWOU422WG. Impact to the potentially high-biased butyl benzyl phthalate result for sample 15FWOU421WG and the bis(2-ethylhexyl)phthalate result for sample 15FWOU422WG is negligible as the results are less than the cleanup levels. However, the high-biased bis(2-ethylhexyl)phthalate LCS recovery may have adversely impacted the result for sample 15FWOU421WG, which was detected at a concentration (14 µg/L) exceeding the ADEC cleanup level (6 µg/L). Moreover, sample 15FWOU421WG is a field duplicate of primary sample 15FWOU420WG and bis(2-ethylhexyl)phthalate was non-detect in the primary sample. Additionally, 2,4-dinitrophenol and 2-nitrophenol had RPD values greater than the control limit, but had acceptable LCS and LCSD recoveries. Neither analyte was detected in associated samples so no data qualifications were applied.

- The VOC LCS and LCSD sample contained in extraction batch 206347 recovered above the upper control limit for dichlorodifluoromethane and methylene chloride (report 580-55009). The results of the aforementioned analytes in associated sample 15FWOU426WG were qualified (J+) as potential high estimates. Impact to the data is negligible as the results are potentially high-biased and are less than respective ADEC cleanup levels.
- The SVOC LCS and/or LCSD sample contained in extraction batch 205525 recovered outside control limits for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-55009). Low recoveries include 4-nitroaniline, 4,6-dinitro-2-methylphenol, anthracene, 3,3′-dichlorobenzidine, 2,4-dimethylphenol, 4-chloroaniline, hexachlorocyclopentadiene, and 3-nitroaniline. All results for 3,3′-dichlorobenzidine and 4-chloroaniline in associated sample 15FWOU424WG were rejected (qualified "R") due to recoveries below 10%. Neither analyte is a site contaminant of concern so impact to the project is negligible. The remaining aforementioned analytes (4-nitroaniline, 4,6-dinitro-2-methylphenol, anthracene, 2,4-dimethylphenol, hexachlorocyclopentadiene, and 3-nitroaniline) were qualified (J-) in associated sample 15FWOU424WG as potential low estimates; however, impact to the project is negligible as the results are either non-detect with LODs two to five orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. High recoveries include butyl benzyl phthalate and bis(2-ethylhexyl)phthalate.

Bis(2-ethylhexyl)phthalate also had a RPD value greater than the control limit. Consequently, the bis(2-ethylhexyl)phthalate result for associated sample 15FWOU424WG was qualified (J+) as a potential high estimate. The affected bis(2-ethylhexyl)phthalate result may have been adversely impacted by the high-biased LCS recovery as the recovery was two times the spiked amount and the result in the sample is three times the cleanup level. However, bis(2-ethylhexyl)phthalate also exceeded in this well (AP-6532) during the spring 2015 sampling event (and prior to that exceeded in 2009). Butyl benzyl phthalate was not detected in the associated project sample, so no data were qualified. Additionally, 2,4-dinitrophenol (35%) and 2-nitrophenol had RPD values greater than the control limit, but had acceptable LCS and LCSD recoveries. Neither analyte was detected in the associated sample so no data qualifications were applied.

- The SVOC LCS and/or LCSD sample contained in extraction batch 205802 recovered below the lower control limit for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-55009). Low recoveries include benzyl alcohol, 2-nitrophenol, 2,4-dimethylphenol, 4-chloroaniline, hexachlorocyclopentadiene, acenaphthylene, 3-nitroaniline, 2,4-dinitrophenol, 2,4-dinitrotoluene, 4-nitroaniline, 4,6-dinitro-2-methylphenol, n-nitrosodiphenylamine, anthracene, 3,3′-dichlorobenzidine, and benzo(a)pyrene. All results for 4-chloroaniline, hexachlorocyclopentadiene, 3-nitroaniline, and 3,3′-dichlorobenzidine in associated samples 15FWOU425WG and 15FWOU426WG were rejected (qualified "R") due to recoveries of both the LCS and LCSD samples being below 10%. The remaining aforementioned analytes (benzyl alcohol, 2-nitrophenol, 2,4-dimethylphenol, acenaphthylene, 2,4-dinitrophenol, 2,4-dinitrotoluene, 4-nitroaniline, 4,6-dinitro-2-methylphenol, n-nitrosodiphenylamine, anthracene, and benzo(a)pyrene) were qualified (J-) as potential low estimates in associated samples 15FWOU425WG and 15FWOU426WG; however, impact to the project is negligible as the analytes are not site contaminants of concern, and the affected results are either detected at trace concentrations (or are non-detect) with LODs one to six orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. Additionally, 2-methylphenol and benzoic acid had RPD values greater than the control limit, but had acceptable LCS and LCSD recoveries. Consequently, the detected benzoic acid result in associated sample 15FWOU426WG was qualified (J) as a potential estimate due to batch imprecision. Impact to the affected benzoic acid datum is negligible as the failure was not significant and the affected result is five orders of magnitude less than the ADEC cleanup level. 2-Methylphenol was not detected in associated samples so no data qualifications were applied.

2.5 Matrix Spike Samples and Sample Duplicates

MS samples were prepared by adding spike compounds to project samples in order to assess potential matrix interference. The performance of a MS sample analysis is a requirement in every QC batch, at a minimum frequency of 1 for every 20 samples, to evaluate recovery accuracy. Precision of each QC batch is evaluated by performing either a MSD sample analysis or a sample duplicate analysis and calculating the RPD. All MS/MSD samples were performed as required, with the exceptions bulleted below. In all cases, batch accuracy and precision was verified through LCS/LCSD recoveries.

- VOC QC batches: 187340 (report 580-48876), 206157 (report 580-54924), and 206157 and 206259 (report 580-55009)
- A project-specific MS/MSD sample was performed in SVOC extraction batch 205525 (report 580-55009); however, the parent sample is associated with a different SDG and the results were discussed in preceding report 580-54924. Additionally, a MS/MSD sample was analyzed in SVOC extraction batch 205802, but the spike compounds were inadvertently omitted during the extraction process.
- Sulfate QC batch: 206699 (report 580-55009)

All MS/MSD and/or laboratory duplicate samples were performed, as required, with the exception of one SVOC batch discussed in the first bullet below. The accuracy of the analyte recoveries, and the precision of the MS/MSD or laboratory duplicate pairs, were evaluated. Only the MS/MSD recovery and/or RPD exceedances that resulted in data qualification are summarized below. See the associated ADEC Laboratory Data Review Checklists for further details, including comparisons of percent recoveries and RPDs to control limits.

- The VOC MSD prepared from sample 15FWOU413WG recovered marginally below the lower control limit for sec-butylbenzene (report 580-48876). Consequently, the sec-butylbenzene result of the parent sample and associated field duplicate sample (15FWOU414WG) was qualified (J-) as a potential low estimate. Impact to data quality is negligible as the failure was marginal, the MS recovery was within limits, and the affected result is more than two orders of magnitude less than the ADEC cleanup level.
- The SVOC MS and MSD prepared from sample 15FWOU411WG recovered below the lower control limit for 4-nitroanaline, 3,3′-dichlorobenzidine, and bis(2-ethylhexyl)phthalate (report 580-48876). 4-Nitroanaline also exceeded the RPD criterion due to the recovery failures. Consequently, the 4-nitroanaline result of the parent sample as associated field duplicate sample (15FWOU412WG) was qualified (J-) as a potential low estimate. Impact to the project was negligible as the analyte does not have an established ADEC cleanup level. The 3,3′-dichlorobenzidine result was rejected (qualified 'R') in the field duplicate pair as the result was non-detect and the recoveries were <10%. Impact to the project is negligible as the analyte is not a site contaminant of concern. The recovery criteria was not applicable for bis(2-ethylhexyl)phthalate as the sample result was greater than the spike concentrations. Additionally, several analytes exceeded the MS/MSD RPD criterion; however, all analytes were non-detect in the parent sample so qualifications were not applied. See the associated ADEC checklist for further details.
- The SVOC MS and/or MSD prepared from sample 15FWOU413WG recovered below the lower control limit for phenol, benzoic acid, 4-chloroanaline, 3-nitroanaline, 4-nitroanaline, and 3,3′-dichlorobenzidine (report 580-48876). Benzoic acid and 3-nitroanaline also exceeded the RPD criterion due to the recovery failures. Consequently, the results for the aforementioned analytes (except for 3,3′-dichlorobenzidine) of the parent sample and associated field duplicate sample (15FWOU414WG) were qualified (J-) as potential low estimates. Impact to the project

was negligible as the analytes are non-detect with LODs a minimum of four orders of magnitude less than the ADEC cleanup level or do not have an established ADEC cleanup level. The 3,3′-dichlorobenzidine result was rejected (qualified 'R') in the field duplicate pair as the result was non-detect and the recoveries were less than 10%. Impact to the project is negligible as the analyte is not a site contaminant of concern. In addition, the MS/MSD recovered above the upper control limit for 4-nitrophenol; however, the analyte was not detected in the parent sample so no data were qualified. The MS sample recovered below the lower limit and the MSD recovered above the upper limit for bis(2-ethylhexyl)phthalate, but the recovery criteria were not applicable as the sample result was greater than the spike concentrations. Bis(2-ethylhexyl)phthalate also exceeded the MS/MSD RPD criterion but no data were qualified because the concentration in the parent sample was non detect.

- Antimony marginally exceeded the RPD criterion (20%) for the laboratory duplicate of sample 15FWOU411WG. Consequently, the antimony result for this sample was qualified (J) as a potential estimate due to imprecision. The impact to data quality is negligible as the RPD exceedance is marginal and the result is one order of magnitude less than the ADEC cleanup level. Moreover, a field duplicate sample (15FWOU412WG) was also collected on this well (AP-8063) and the field duplicate sample pair had an acceptable RPD value.
- The VOC MS and/or MSD prepared from sample 15FWOU420WG recovered above the upper control limit for several analytes (see pages 89 and 90 of PDF report 580-48876). However, with the exception of the four analytes discussed below, these analytes were not detected in the parent sample, so no data qualifications were applied. The elevated recoveries of benzene, cis-1,2-dichloroethene, toluene, and naphthalene resulted in qualification ("J+"-flags) of the detected concentrations in the parent sample and associated field duplicate sample (15FWOU421WG) (note that naphthalene was not detected in the field duplicate and was not qualified). With the exception of benzene, the affected results were potentially high-biased and several times below ADEC cleanup levels, so impact to the project is negligible. The impact to benzene data is also negligible as benzene has exceeded the ADEC cleanup level in this well (AP-10257MW) during five out of six sampling events since the well was installed in 2012.
- The SVOC MS and/or MSD prepared from sample 15FWOU420WG recovered outside control limits for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-54924). Low recoveries were noted for 2,4-dimethylphenol, 3-nitroaniline, 4-nitroaniline, anthracene, 3,3′-dichlorobenzidine, benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The 4-nitroaniline and 3,3′-dichlorobenzidine results in the parent sample and associated field duplicate (15FWOU421WG) have been rejected due to LCS/LCSD recovery discrepancies, as discussed above. Moreover, the 3-nitroaniline results in these samples are rejected (qualified "R") due to MS/MSD recoveries below 10%. The remaining analytes exhibiting low MS/MSD recoveries (2,4-dimethylphenol, anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene) were qualified (J-) as potential low estimates in the parent sample and associated field duplicate sample (15FWOU421WG). The impact to data quality is likely negligible as the affected results are either non-detect with LODs one to five orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. High MS

and/or MSD recoveries were noted for benzoic acid, pentachlorophenol, di-n-butyl phthalate, butyl benzyl phthalate, and bis(2-ethylhexyl)phthalate. Pentachlorophenol was not detected in the parent or field duplicate sample, so no data qualifications were applied. The detected results for the remaining analytes in the parent sample and/or associated field duplicate sample were qualified (J+) as potential high-estimates as follows: 15FWOU420WG (benzoic acid) and 15FWOU421WG (di-n-butyl phthalate, butyl benzyl phthalate, and bis(2-ethylhexyl)phthalate). Impact to the benzoic acid, di-n-butyl phthalate, and butyl benzyl phthalate data is negligible as the affected results are a minimum of four orders of magnitude less than ADEC cleanup levels. However, the affected bis(2-ethylhexyl)phthalate result is more than two times the ADEC cleanup level. Note that the batch also contained a high-biased LCS recovery of bis(2-ethylhexyl)phthalate, which was further discussed in Section 2.4.

- The VOC MS and/or MSD prepared from sample 15FWOU425WG recovered above the upper control limit for dichlorodifluoromethane and vinyl chloride, and the RPD for vinyl chloride also exceeded the criterion due to the recovery failure (report 580-55009). Consequently, the detected results of dichlorodifluoromethane in the parent sample and associated field duplicate sample (15FWOU426WG) were qualified (J+) as potential high estimates. Impact to data quality is negligible as the affected results are four orders of magnitude less than the ADEC cleanup level. Vinyl chloride was not detected in the parent sample, so no data were qualified. Moreover, 4-methyl-2-pentanone recovered below the lower control limit, which resulted in data qualification ("J-" flags) of the field duplicate pair. Impact to 4-methyl-2-pentanone data quality is negligible as the failure was not significant and the affected results were non-detect with LODs four orders of magnitude less than the cleanup level. Additionally, chloromethane, acetone, 2,2-dichloropropane, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, 1,2-dibromo-3-chloropropane, 1,2,4-trichlorobenzene, 1,2,3-trichlorobenzene, and naphthalene had RPD values greater than the control limit, but had acceptable MS and MSD recoveries. Of the aforementioned analytes, only naphthalene was detected (not in the parent sample but in the associated field duplicate). Consequently, the naphthalene result in field duplicate sample 15FWOU426WG was qualified (J) as a potential estimate. Impact to naphthalene data quality is negligible as the detection was three orders of magnitude less than the ADEC cleanup level.
- The sulfate MS and MSD prepared from sample 15FWOU425WG recovered above the upper control limit (report 580-55009). Consequently, the sulfate result in parent sample and associated field duplicate sample (15FWOU426WG) were qualified (J+) as potentially high-biased estimates. Impact to data is negligible as the recovery exceedances were marginally above control limits and the sulfate results from this well (AP-6535) are consistent with historical concentrations.
- The metals MSD prepared from sample 15FWOU425WG recovered above the upper control limit for cadmium, lead, and thallium (report 580-55009). Consequently, detected results for cadmium and lead were qualified (J+) as potential high estimates in the parent sample and associated field duplicate sample (15FWOU426WG), as follows: cadmium: 15FWOU425WG; and lead: 15FWOU425WG and 15FWOU426WG. Impact to the data quality is negligible as the recovery exceedances were marginal and the affected data are less than the respective ADEC

cleanup level. Thallium was not detected in either sample, so no data were qualified due to the high recovery.

2.6 Surrogates

Surrogate compounds were added to project samples by the laboratory prior to analysis, in accordance with method requirements. Surrogate recoveries were then calculated as percentages and reported by the laboratory as a measure of analytical extraction efficiency. The following surrogate recoveries were outside the established control limits and resulted in data qualification. See the associated ADEC Laboratory Data Review Checklists for further details, including comparisons of percent recoveries to control limits.

- VOC surrogate 1,2-dichloroethane-d4 recovered below control limits in sample 15FWOU422WG (report 580-54924). Consequently, all VOCs in the sample were qualified (J-) due to the low surrogate recovery. Impact to the data is likely negligible as the failure was marginal, 4 of 5 surrogates had acceptable recoveries, and VOC results are consistent with recent concentrations for this well (AP-6530).
- SVOC surrogate terphyenyl-d14 recovered above the upper control limits in sample 15FWOU424WG (report 580-55009). Consequently, all detected SVOC analytes in the sample were qualified (J+) as potential high estimates. Impact to the data is likely negligible as the surrogate recovery failure was marginal, and 5 of 6 surrogates had acceptable recoveries.

2.7 Field Duplicates

Four field duplicate samples were collected and submitted to the laboratory as blind samples during groundwater sampling operations at the OU4 sites; two associated with the landfill and two associated with the CAT shed (Building 1191) leach field. Field duplicate samples were collected at a minimum frequency of 10 percent for each analytical method, which meets the UFP-QAPP requirement.

Field duplicate results of the contaminants of concern (only) and natural attenuation parameters are summarized in Table B-3. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results in Table B-3 are identified with "ND" and the LOD in parentheses. If both results of the field duplicate pair were less than the LOQ (i.e., either J-flagged or ND), the RPD was calculated but the comparison criterion is not applicable. All field duplicate sample results were within the ADEC criterion of ≤30% and, therefore, are considered comparable, with the exception of those identified in gray shading in Table B-3. The results that exceeded the criterion in the field duplicate pairs were qualified (J) as potential estimates due to imprecision. The RPD exceedances for methane, benzene, and cis-1,2-dichloroethene are not significant and the affected results are consistent with the concentration ranges historically observed in these wells. The RPD exceedances for bis(2-ethylhexyl)phthalate are more significant and are attributed to batch LCS recovery failures and/or matrix interferences, as suggested by the failing MS/MSD recoveries of the primary sample (see Section 2.5). Additional details and discussion are provided in the ADEC Laboratory Data Review Checklists.

Field duplicate results for other analytes (non-contaminants of concern) for this site are compared and qualified, as appropriate, in the associated ADEC Laboratory Data Review Checklists at the end of Appendix B. They are also included below in Table B-6, Summary of Groundwater Data Qualifications.

Table B-3 – Groundwater Field Duplicate Sample Results Evaluation

Analyte	**Method**	**15FWOU411WG[1] (primary)**	**Qualifier**	**15FWOU412WG[1] (Field Duplicate)**	**Qualifier**	**RPD**	**Comparison Criteria Met?4**
Sulfate	E300.0	4.6		4.3		7	Yes
Methane	RSK175	2100		1500		33	No
Iron	SW6010C	23000		24000		4	Yes
Antimony	SW6020A	0.63	J	0.55	J	14	Yes
Arsenic	SW6020A	4.3	J	4.2	J	2	Yes
Barium	SW6020A	140		140		0	Yes
Beryllium	SW6020A	ND(1.3)		ND(1.3)		0	Yes
Cadmium	SW6020A	ND(0.3)		0.22	J	31	Not Applicable
Chromium	SW6020A	4.6		5.4		16	Yes
Cobalt	SW6020A	1	J	0.98	J	2	Yes
Copper	SW6020A	5.9	J	5.7	J	3	Yes
Lead	SW6020A	3.7		3.7		0	Yes
Nickel	SW6020A	3.7	J	4.2	J	13	Yes
Selenium	SW6020A	ND(4)		ND(0.35)		168	Not Applicable
Silver	SW6020A	ND(0.35)		ND(2.5)		151	Not Applicable
Thallium	SW6020A	ND(2.5)		ND(10)		120	Not Applicable
Vanadium	SW6020A	7.9	J	8.5	J	7	Yes
Zinc	SW6020A	38		41		8	Yes
1,1,2,2-Tetrachloroethane	SW8260C	ND(0.5)		ND(0.5)		0	Yes
1,1,2-Trichloroethane	SW8260C	ND(0.5)		ND(0.5)		0	Yes
Benzene	SW8260C	ND(1)		ND(1)		0	Yes
Trichloroethene (TCE)	SW8260C	0.78	J	0.72	J	8	Yes
Vinyl chloride	SW8260C	ND(0.5)		ND(0.5)		0	Yes
cis-1,2-Dichloroethene	SW8260C	4.5		4.6		2	Yes
bis-(2-Ethylhexyl)phthalate	SW8270D	2.8	J	5.7		68	No

Table B-3 – Groundwater Field Duplicate Sample Results Evaluation (continued)

Analyte	Method	15FWOU413WG[1] (primary)	Qualifier	15FWOU414WG[1] (Field Duplicate)	Qualifier	RPD	Comparison Criteria Met?[4]
Sulfate	E300.0	22		23		4	Yes
Methane	RSK175	2300		2500		8	Yes
Iron	SW6010C	2400		2500		4	Yes
Antimony	SW6020A	1.3	J	1.1	J	17	Yes
Arsenic	SW6020A	1.5	J	1.6	J	6	Yes
Barium	SW6020A	160		170		6	Yes
Beryllium	SW6020A	ND(1.3)		ND(1.3)		0	Yes
Cadmium	SW6020A	0.32	J	0.38	J	17	Yes
Chromium	SW6020A	2.2		2		10	Yes
Cobalt	SW6020A	22		23		4	Yes
Copper	SW6020A	9.9	J	8.1	J	20	Yes
Lead	SW6020A	0.19	J	ND(0.5)		90	Not Applicable
Nickel	SW6020A	60		66		10	Yes
Selenium	SW6020A	ND(4)		ND(4)		0	Yes
Silver	SW6020A	ND(0.35)		ND(0.35)		0	Yes
Thallium	SW6020A	ND(2.5)		ND(2.5)		0	Yes
Vanadium	SW6020A	ND(10)		ND(10)		0	Yes
Zinc	SW6020A	30	J	35		15	Yes
1,1,2,2-Tetrachloroethane	SW8260C	ND(0.5)		ND(0.5)		0	Yes
1,1,2-Trichloroethane	SW8260C	ND(0.5)		ND(0.5)		0	Yes
Benzene	SW8260C	14		14		0	Yes
Trichloroethene (TCE)	SW8260C	ND(1)		ND(1)		0	Yes
Vinyl chloride	SW8260C	ND(0.5)		ND(0.5)		0	Yes
cis-1,2-Dichloroethene	SW8260C	3.1		3.3		6	Yes
bis-(2-Ethylhexyl)phthalate	SW8270D	2.1	J	4.1		65	No

Analyte	Method	15FWOU420WG[2] (primary)	Qualifier	15FWOU421WG[2] (Field Duplicate)	Qualifier	RPD	Comparison Criteria Met?[4]
Sulfate	E300.0	270		270		0	Yes
Methane	RSK175	2700		2300		16	Yes
Iron	SW6010C	ND(360)		ND(360)		0	Yes
Antimony	SW6020A	1.9	J	1.8	J	5	Yes
Arsenic	SW6020A	ND(4)		ND(4)		0	Yes
Barium	SW6020A	200		200		0	Yes
Beryllium	SW6020A	ND(1.3)		ND(1.3)		0	Yes
Cadmium	SW6020A	1.1	J	0.99	J	11	Yes
Chromium	SW6020A	1.2	J	1	J	18	Yes
Cobalt	SW6020A	26		26		0	Yes
Copper	SW6020A	15		15		0	Yes
Lead	SW6020A	ND(0.5)		ND(0.5)		0	Yes
Nickel	SW6020A	77		75		3	Yes
Selenium	SW6020A	ND(4)		ND(4)		0	Yes
Silver	SW6020A	ND(0.35)		ND(0.35)		0	Yes
Thallium	SW6020A	ND(2.5)		ND(2.5)		0	Yes

Table B-3 – Groundwater Field Duplicate Sample Results Evaluation (continued)

Analyte	Method	15FWOU420WG2 (primary)	Qualifier	15FWOU421WG2 (Field Duplicate)	Qualifier	RPD	Comparison Criteria Met?[4]
Vanadium	SW6020A	ND(10)		ND(10)		0	Yes
Zinc	SW6020A	68		68		0	Yes
1,1,2,2-Tetrachloroethane	SW8260C	ND(0.50		ND(0.50)		0	Yes
1,1,2-Trichloroethane	SW8260C	ND(0.50		ND(0.50)		0	Yes
Benzene	SW8260C	7.4	J+	5.3	J+	33	No
Trichloroethene (TCE)	SW8260C	ND(1.0)		ND(1.0)		0	Yes
Vinyl chloride	SW8260C	ND(0.50)		ND(0.50)		0	Yes
cis-1,2-Dichloroethene	SW8260C	3.1	J+	1.9	J+	48	No
bis-(2-Ethylhexyl)phthalate	SW8270D	ND(2.1)		14	J+	148	No

Analyte	Method	15FWOU425WG[3] (primary)	Qualifier	15FWOU426WG[3] (Field Duplicate)	Qualifier	RPD	Comparison Criteria Met?[4]
Sulfate	E300.0	18	J,J+	18	J+	0	Yes
Methane	RSK175	1600	J	1300		21	Yes
Iron	SW6010C	29000		30000		3	Yes
Antimony	SW6020A	ND(1)		ND(1)		0	Yes
Arsenic	SW6020A	2.4	J	2.2	J	9	Yes
Barium	SW6020A	270		270		0	Yes
Beryllium	SW6020A	ND(1.3)		ND(1.3)		0	Yes
Cadmium	SW6020A	0.27	J,J+	ND(0.3)		11	Yes
Chromium	SW6020A	1.6	J	1.3	J	21	Yes
Cobalt	SW6020A	ND(0.6)		ND(0.6)		0	Yes
Copper	SW6020A	ND(7.5)		ND(7.5)		0	Yes
Lead	SW6020A	0.52	J,J+	0.39	J,J+	29	Yes
Nickel	SW6020A	ND(5)		ND(5)		0	Yes
Selenium	SW6020A	ND(4)		ND(4)		0	Yes
Silver	SW6020A	ND(0.35)		ND(0.35)		0	Yes
Thallium	SW6020A	ND(2.5)		ND(2.5)		0	Yes
Vanadium	SW6020A	ND(10)		ND(10)		0	Yes
Zinc	SW6020A	ND(20)		ND(20)		0	Yes
1,1,2,2-Tetrachloroethane	SW8260C	ND(0.50)		ND(0.50)	J-	0	Yes
1,1,2-Trichloroethane	SW8260C	ND(0.50)		ND(0.50)	J-	0	Yes
Benzene	SW8260C	3.4	J	3.4	J-	0	Yes
Trichloroethene (TCE)	SW8260C	0.60	J	0.59	J,J-	2	Yes
Vinyl chloride	SW8260C	ND(0.50)		ND(0.50)	J-	0	Yes
cis-1,2-Dichloroethene	SW8260C	33	J	33	J-	0	Yes
bis-(2-Ethylhexyl)phthalate	SW8270D	ND(2.0)		ND(2.1)		5	Yes

All results are in micrograms per liter (µg/L), except for sulfate, which is in milligrams per liter (mg/L). Non-detected (ND) results are shown with limits of detection (LODs) in brackets, which are used for relative percent difference (RPD) calculations.

[1] – The samples are associated with report 580-48876.

[2] – The samples are associated with report 580-54924.

[3] – The samples are associated with report 580-55009.

[4] – RPD of ≤30 percent was used for evaluating water-matrix field duplicate samples.

2.8 Performance Evaluation Samples

Project laboratory performance was evaluated by the submission of performance evaluation (PE) samples. Prior to 2012, PE samples were ordered and submitted for analysis for each Fort Wainwright project. Since 2012, one set of PE samples has been submitted on an annual basis to evaluate the performance of each laboratory employed for Fort Wainwright projects. The PE samples associated with TAL projects were submitted with OU4 project samples and reported with SDG 580-48876; the performance results in which are to be extrapolated to all TAL projects.

The PE samples were prepared by Environmental Resource Associates (ERA) and arrived in Fairbanks in good condition. The sample containers were subsequently relabeled and submitted blindly to the laboratory with the project samples. All the PE samples applicable to OU4 were submitted with OU4 project samples with the following sample ID: 15FWOU416WG (VOC, SVOC, and metals).

The PE sample results for the OU4 site contaminants of concern are summarized in Table B-4. All PE sample results for contaminants of concern were within the performance acceptance range as determined by the PE sample manufacturer as presented in the table. The PE sample Certificates of Analysis are provided at the end of Appendix B.

Table B-4 – Performance Evaluation Sample Summary

Contaminants of Concern	Method	Spike Concentration (μg/L)	Acceptable Range (μg/L)[1]	Laboratory Result (μg/L)	Within Acceptable Range?
Antimony	SW6020A	271	1780-2450	280	Yes
Arsenic		136	103-169	140	Yes
Barium		777	660-894	830	Yes
Beryllium		214	182-246	220	Yes
Cadmium		424	360-488	450	Yes
Chromium		331	281-381	360	Yes
Cobalt		516	439-593	580	Yes
Copper		242	206-278	270	Yes
Lead		812	690-934	860	Yes
Nickel		521	454-592	550	Yes
Selenium		776	660-892	840	Yes
Silver		796	677-915	860	Yes
Thallium		606	501-701	620	Yes
Vanadium		1070	910-1230	1100	Yes
Zinc		885	802-974	940	Yes
1,1,2,2-Tetrachloroethane	SW8260C	13.0	10.0-16.6	14	Yes
1,1,2-Trichloroethane		2.78	2.20-3.36	2.7	Yes
Benzene		17.0	13.7-20.2	16	Yes
Trichloroethene		11.6	8.89-13.7	10	Yes
Vinyl chloride		7.00	4.47-10.2	5.7	Yes
cis-1,2-Dichloroethene		12.0	9.24-14.8	12	Yes
bis(2-Ethylhexyl)phthalate	SW8270D	15.6	8.10-18.9	16	Yes

[1] Acceptable ranges for PE samples are from Certificates of Analysis included at the end of Appendix B.

μg/L – micrograms per liter

2.9 Additional Quality Control Discrepancies

Additional QC samples and procedures not discussed in the preceding sections of this CDQR are evaluated if deviations are noted by the laboratory in the case narratives. Additional QC samples/procedures may include, but are not limited to, instrument tuning, initial calibration verification (ICV) samples, continuing calibration verification (CCV) samples, and internal standards.

Several QC discrepancies were noted by the laboratory, not all of which resulted in data qualification. Discrepancies that did not result in data qualification are not summarized in this CDQR, but are discussed in associated ADEC Laboratory Data Review Checklists. Discrepancies that did result in data qualification are detailed below.

- Several 8260C and 8270D analytes (bulleted below) recovered below the minimum response factor (RF) and/or lower control limit in CCV samples associated with all three SDGs. Results for these analytes in associated project samples were qualified (J-) as low estimates based upon the low CCV recoveries. The associated laboratory reports are presented below, but analyte recoveries and corresponding QC batches are only presented in the ADEC Laboratory Data Review Checklists. With the exception of n-nitrosodi-n-propylamine, impact to results is minor as all detections or non-detect LODs were a minimum of one order of magnitude below the ADEC cleanup levels or cleanup levels were not established. Additionally, none of these analytes are contaminants of concern at the OU4 sites. The affected results for n-nitrosodi-n-propylamine are non-detect and the LODs are greater than the cleanup level. However, n-nitrosodi-n-propylamine is also not a site contaminant of concern and the inadequate sensitivity for its analysis was identified in the work plan. Further discussion is presented in associated ADEC Laboratory Data Review Checklists.
    - 2-butanone: 15FWOU407WG through 15FWOU416WG (report 580-48876); 15FWOU424WG through 15FWOU426WG (report 580-55009)
    - 2-hexanone: 15FWOU426WG (report 580-55009)
    - 2,4-dinitrophenol: 15FWOU418WG through 15FWOU422WG (report 580-54924); 15FWOU424WG (report 580-55009)
    - 4-methyl-2-pentanone: 15FWOU424WG through 15FWOU426WG (report 580-55009)
    - 4,6-dinitro-2-methyphenol: 15FWOU418WG through 15FWOU422WG (report 580-54924); 15FWOU424WG (report 580-55009).
    - bis(2-chloroethoxy)methane: 15FWOU401WG through 15FWOU416WG (report 580-48876)
    - isophorone: 15FWOU401WG through 15FWOU416WG (report 580-48876)
    - n-nitrosodi-n-propylamine: 15FWOU401WG through 15FWOU416WG (report 580-48876); 15FWOU424WG through 15DWOU426WG (report 580-55009).
- The VOC CCV associated with analytical batches 206259 and 206347 recovered above the upper control limit for dichlorodifluoromethane (report 580-55009). Consequently, the dichlorodifluoromethane results in associated samples 15FWOU424WG through 15FWOU426WG were qualified (J+) as potential high estimates. Impact to data quality is negligible as the

affected data are potentially high-biased and four orders of magnitude less than the ADEC cleanup level.

- During the initial analysis of VOC samples 15FWOU407WG and 15FWOU409WG, a saturation of target analytes 1,1,2,2-tetrachlorethane, trichloroethene, and cis-1,2-dichloroethene was observed (report 580-48876). To support the initial analysis, the samples were diluted and reanalyzed one day outside of the method holding time (the results in which were reported as secondary). Due to the saturation of the analytes in the initial run, the results are qualified (J) as potential estimates of unknown bias. The impact to the project is likely negligible as the results are consistent with the concentration ranges observed for these wells since at least 2007 (AP-5588 and AP-5589, respectively); analytes that have either consistently exceeded the cleanup level or that have consistently been less than the cleanup continue to do so for both affected wells in this data set.

2.10 Analytical Sensitivity

Several project data analytes were reported above the DL but below the LOQ and were thus qualified as estimates due to the unknown accuracy of the analytical method at those concentrations. These data qualifications are not reported again in this CDQR, but they are noted with a "J" in the associated results table in Appendix C.

Analytical sensitivity was evaluated to verify that LODs met the applicable cleanup level for non-detect results. Two VOC analytes (1,2,3-trichloropropane and 1,2-dibromoethane (EDB)), one SVOC analyte (n-nitrosodi-n-propylamine) and one metal (thallium) analyzed by methods SW8260C, SW8270D, and SW6020A, respectively, did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345 in all project samples. Therefore, the aforementioned analytes may not be detected, if present, at the respective cleanup level. The affected VOC and SVOC analytes are not site contaminants of concern and the inadequate analytical sensitivity for these analytes were identified in the work plan, so impact to the project is negligible. Although the analysis of thallium is a requirement of the landfill permit, impact to the project is likely negligible as thallium has been non-detected or detected only at trace concentrations at this site since 1997.

In addition, SVOC sample 15FWOU424WG required dilution (5x), which effectively elevated LODs (report 580-55009). Consequently, SVOC analytes bis-(2-chloroethyl)ether, dibenzo(a,h) anthracene, hexachlorobenzene, and pentachlorophenol have LODs slightly above respective ADEC cleanup levels. Impact to data quality is likely negligible as none of these analytes are contaminants of concern and are typically non-detect at this site.

Non-detect results with LODs in excess of the cleanup level are highlighted gray in the analytical results table (Table C-2).

2.11 Non-ROD COC that Exceeded the Cleanup Level

One non-Record of Decision (ROD) contaminant, 2,6-dinitrotoluene (2,6-DNT), was detected above the ADEC cleanup level in well AP-6532 during the 2015 spring and fall sampling events. 2,6-DNT was also detected in the same well during the spring and fall sampling events in 2013, as well as in three other wells since 2010. The 2,6-DNT results exceeding the ADEC groundwater cleanup level are summarized in Table B-5 on the following page.

Table B-5 – Non-ROD Analyte Cleanup Level Exceedances

Year	Analyte	Cleanup Level (μg/L)	Well	Spring Result (μg/L)	Fall Result (μg/L)
2010	2,6-Dinitrotoluene	1.3	AP-8061	0.084	ND (10)
			AP-6132	0.048	ND (9.6)
2012			AP-5588	no sampling event performed	4.2 J
2013			AP-6532	1.7 J / 1.7 J	1.3 J
2015				3.6	4.8

The source of 2,6-DNT at the Fort Wainwright landfill area cannot be conclusively determined. However, common uses of DNT include the manufacturing of munitions, polyurethane polymers, and herbicides, which may be associated with the landfill contents.

2,4-DNT and 2,6-DNT are the two most common isomers of the chemical; both of which will continue to be monitored on a semi-annual basis (2,4-DNT has not been detected at the site). Similar to other site contaminants, 2,6-DNT seems to be contained within the plume and hasn’t migrated to the farthest downgradient wells.

2.12 Summary of Qualified Results

Overall, the review process deemed the groundwater project data acceptable for use. Several results were qualified as estimates; however, data quality impact is minor. In addition, four analytes (3-nitroaniline, 4-chloroaniline, hexachlorocyclopentadiene, and/or 3,3’-dichlorobenzidine) were rejected in two to five samples due to LCS/LCSD or MS/MSD recoveries of less than 10 percent. Impact to the project is negligible as none of the analytes are OU4 site contaminants of concern.

Table B-6 summarizes the qualified 2015 groundwater results associated with the sampling events at the OU4 sites, including the associated sample numbers, analytes, and the reason for qualification.

Table B-6 – Summary of Groundwater Data Qualifications

SDG	Sample Numbers	Analytes	Qualification	Explanation
580-48876	15FWOU401WG – 15FWOU407WG 15FWOU409WG trip blank 15FWOU417WQ	methylene chloride	B	Method blank contamination
	15FWOU411WG – 15FWOU414WG	3,3’-dichlorobenzidine	R	MS and MSD recovery < 10%
	15FWOU411WG 15FWOU412WG	4-nitroanaline	J-	Low MS and/or MSD recovery
	15FWOU413WG 15FWOU414WG	sec-butylbenzene phenol benzoic acid 4-chloroanaline 3-nitroanaline 4-nitroanaline		
	15FWOU407WG – 15FWOU416WG	2-butanone		Low CCV recovery and/or RF
	15FWOU401WG – 15FWOU416WG	n-nitrosodi-n-propylamine isophorone bis(2-chloroethoxy)methane		
	15FWOU407WG 15FWOU409WG	1,1,2,2-tetrachlorethane trichloroethene cis-1,2-dichloroethene	J	Column saturation
	15FWOU411WG 15FWOU412WG	antimony		Laboratory duplicate imprecision
		methane bis(2-ethylhexyl)phthalate		Field duplicate imprecision
	15FWOU413WG 15FWOU414WG	bis(2-ethylhexyl)phthalate		
580-54924	15FWOU421WG	benzyl butyl phthalate di-n-butyl phthalate	B	Method blank contamination
	15FWOU418WG – 15FWOU422WG	diethyl phthalate		
	trip blank 15FWOU423WQ	methylene chloride		
	15FWOU418WG 15FWOU420WG trip blank 15FWOU423WQ	Naphthalene (8260C)		
	15FWOU418WG – 15FWOU422WG	3,3’-dichlorobenzidine 4-chloroaniline	R	LCS and/or LCSD recovery < 10%
	15FWOU418WG – 15FWOU422WG	4-nitroaniline 4,6-dinitro-2-methylphenol anthracene 2,4-dimethylphenol hexachlorocyclopentadiene	J-	Low LCS and/or LCSD recovery
	15FWOU420WG 15FWOU421WG	3-nitroaniline	R	MS and MCSD recoveries < 10%
		2,4-dimethylphenol anthracene benzo(a)pyrene dibenz(a,h)anthracene benzo(g,h,i)perylene	J-	Low MS and/or MSD recovery
	15FWOU422WG	All VOC analytes		Low surrogate recovery
	15FWOU418WG – 15FWOU422WG	2,4-dinitrophenol 4,6-dinitro-2-methyphenol		Low CCV recovery

Table B-6 – Summary of Groundwater Data Qualifications (continued)

SDG	Sample Numbers	Analytes	Qualification	Explanation
580-54924 cont'd	15FWOU421WG	butyl benzyl phthalate	J+	High LCS and/or LCSD recovery
	15FWOU421WG 15FWOU422WG	bis(2-ethylhexyl)phthalate		
	15FWOU420WG 15FWOU421WG	benzene cis-1,2-dichloroethene toluene		High MS and/or MSD recovery
	15FWOU420WG	naphthalene (8260C)		
	15FWOU420WG	benzoic acid		
	15FWOU421WG	di-n-butyl phthalate butyl benzyl phthalate bis(2-ethylhexyl)phthalate		
	15FWOU420WG 15FWOU421WG	benzene cis-1,2-dichloroethene benzyl butyl phthalate bis-(2-ethylhexyl)phthalate	J	Field duplicate imprecision
580-55009	15FWOU424WG	diethyl phthalate	B	Method blank contamination
	15FWOU426WG	carbon disulfide methylene chloride m&p-xylenes		
	15FWOU426WG	Naphthalene (8260C)		Trip blank contamination
	15FWOU424WG	3,3'-dichlorobenzidine 4-chloroaniline	R	LCS and LCSD recovery < 10%
	15FWOU425WG 15FWOU426WG	4-chloroaniline hexachlorocyclopentadiene 3-nitroaniline 3,3'-dichlorobenzidine		
	15FWOU426WG	All VOC analytes	J-	Holding time discrepancy
	15FWOU424WG	4-nitroaniline 4,6-dinitro-2-methylphenol anthracene 2,4-dimethylphenol hexachlorocyclopentadiene 3-nitroaniline		Low LCS and/or LCSD recovery
	15FWOU425WG 15FWOU426WG	benzyl alcohol 2-nitrophenol 2,4-dimethylphenol acenaphthylene 2,4-dinitrophenol 2,4-dinitrotoluene 4-nitroaniline 4,6-dinitro-2-methylphenol n-nitrosodiphenylamine anthracene benzo(a)pyrene		
	15FWOU425WG 15FWOU426WG	4-methyl-2-pentanone		Low MS and/or MSD recovery

Table B-6 – Summary of Groundwater Data Qualifications (continued)

SDG	Sample Numbers	Analytes	Qualification	Explanation
580-55009 cont'd	15FWOU424WG 15FWOU425WG	4-methyl-2-pentanone	J-	Low CCV recovery and/or RF
	15FWOU426WG	4-methyl-2-pentanone 2-hexanone		
	15FWOU424WG	n-nitrosodi-n-propylamine 4,6-dinitro-2-methylphenol 2,4-dinitrophenol		
	15FWOU425WG 15FWOU426WG	n-nitrosodi-n-propylamine		
	15FWOU426WG	dichlorodifluoromethane methylene chloride	J+	High LCS and/or LCSD recovery
	15FWOU424WG	bis(2-ethylhexyl)phthalate		
	15FWOU425WG 15FWOU426WG	dichlorodifluoromethane		High MS and/or MSD recovery
	15FWOU425WG	cadmium		
	15FWOU425WG 15FWOU426WG	lead sulfate		
	15FWOU424WG	All detected SVOCs		High surrogate recovery
	15FWOU424WG 15FWOU425WG	dichlorodifluoromethane		High CCV recovery
	15FWOU426WG	dichlorodifluoromethane		
	15FWOU426WG	benzoic acid	J	LCS/LCSD RPD exceedance
	15FWOU426WG	Naphthalene (8260C)		MS/MSD RPD exceedance
	15FWOU425WG 15FWOU426WG	nitrobenzene bis(2-chloroisopropyl)ether		Field duplicate imprecision

2.13 Completeness

Completeness scores were calculated for each analytical method employed for the project. Scores were obtained by assigning points to 14 different data quality categories during the review process. A maximum of 10 points was awarded for each category; points were based on the number of samples successfully meeting data quality objectives for that category. Points were subtracted when failure to meet DQOs resulted in data qualification or data rejection. The scores were then summed to determine the total points for a method, and completeness scores were determined as follows: (total points received)/(total points possible) x 100.

A breakdown of the points received for each category and method is shown in Table B-7. All OU4 site data quality categories met the completeness criteria of 90 percent established in the QAPP for the sampling events. No data were rejected pursuant to the data quality review, and all data may be used, as qualified, for the purposes of the 2015 OU4 Monitoring Report.

Table B-7 – Completeness Scores for Groundwater Samples

Data Quality Category	Points VOC	Points SVOC	Points Methane	Points Metals	Points Fe	Points Sulfate
Sample Collection	10	10	10	10	10	10
COC Documentation	10	10	10	10	10	10
Sample Containers/Preservation	10	10	10	10	10	10
Cooler Temperature	10	10	10	10	10	10
Holding Times	9	10	10	10	10	10
Method Blanks	9	9	10	10	10	10
Trip Blanks	10	NA	10	NA	NA	NA
Equipment Blank	NA	NA	NA	NA	NA	NA
LCS/LCSD Recovery & RPD	9	7	10	10	10	10
MS/MSD Recovery & RPD	8	8	10	9	10	9
Surrogate Recovery	9	10	NA	NA	NA	NA
Field Duplicate	8	8	9	10	10	10
ICV/CCV	7	7	10	10	10	10
Sensitivity (DL/LOD)	9	9	10	10	10	10
Total Points Received	118	108	119	99	110	109
Total Points Possible	130	120	120	110	110	110
Percent Completeness	91	90	99	99	100	99

NA – not applicable

3.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2016. *18 AAC 75, Oil and Other Hazardous Substances Pollution Control*. January.

ADEC, 2010. *Draft Field Sampling Guidance*. May.

ADEC, 2009. *Technical Memorandum 06-002, Environmental Laboratory Data and Quality Assurance Requirements.* March.

Department of Defense (DoD), 2010. *DoD Quality Systems Manual for Environmental Laboratories, Version 4.2.* October.

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FES, 2014. *Uniform Federal Policy for Quality Assurance Project Plans, Operable Unit Sites, Fort Wainwright, Alaska.* October.

Puls, R.W. and M. J. Barcelona, 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.* EPA/540/S-95/504. April.

Laboratory Data Review Checklist

Completed by: Vanessa Ritchie

Title: Project Chemist

Date: 12/16/15

CS Report Name: Fort Wainwright Operable Unit 4

Report Date: 04/30/15

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: TestAmerica Laboratories, Inc.
Seattle, Washington

Laboratory Report Number: 580-48876

ADEC File Number: 108.38.070.03

ADEC RecKey Number:

1. Laboratory
    a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
    ☐✓Yes No ☐NA (Please explain.) Comments:

    Yes; however, EPA Methods 300.0 and RSK-175 are not listed as CS analyses.

    b. If the samples were transferred to another “network” laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
    ☐Yes No ☐✓NA (Please explain.) Comments:

    Methane analysis via RSK-175 was subcontracted to TestAmerica of Denver, Colorado. The ADEC CS program does not certify for the RSK-175 method. However, the laboratory holds an ELAP certification for the analysis.

2. Chain of Custody (COC)
    a. COC information completed, signed, and dated (including released/received by)?
    ☐✓Yes No ☐NA (Please explain.) Comments:

    b. Correct analyses requested?
    ☐✓Yes No ☐NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
    a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
    ☐ Yes ✓No ☐NA (Please explain.) Comments:

    Coolers 040902, 040903, and 040904 arrived at the laboratory with a temperature blank reading below the acceptable range at 1.1°C, 0.6°C, and 1.7°C, respectively. Since the samples were reportedly received in good condition and the temperatures were above freezing, no data were qualified.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☐✓Yes No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☐✓Yes No ☐NA (Please explain.) Comments:

One of two amber bottles for SVOC sample 15FWOU414WG was received at the laboratory broken. The analysis was performed as requested on the remaining bottle, so no data were impacted.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

☐✓Yes No ☐NA (Please explain.) Comments:

The laboratory noted the broken container and temperature blanks arriving outside the recommended temperature range, as discussed above.

e. Data quality or usability affected? (Please explain.)

Comments:

No data were impacted due to the broken container or low temperatures.

4. Case Narrative

a. Present and understandable?

☐✓Yes No ☐NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☐✓Yes No ☐NA (Please explain.) Comments:

The case narrative described method blank contamination, MS/MSD discrepancies, and LCS RPD discrepancies, which are discussed below in 6aii, 6biii, and 6biv, respectively. It also described CCV discrepancies and the reanalysis of two samples (performed outside of hold time) for confirmation purposes, which are discussed here. CCV discrepancies for analytes not reported in this SDG are not discussed.

The minimum response factor (RF) for 2-butanone was below the lower control limit in the continuing calibration verification (CCV) sample associated with VOC analytical batch 187499. Consequently, the 2-butanone results in samples 15FWOU407WG through 15FWOU416WG were qualified (J-) as potential low estimates. Although all affected results may be low-biased and are non-detect, impact to the project is negligible as the LODs are four orders of magnitude less than the ADEC cleanup level and 2-butanone has historically been non-detect in the wells at this site.

The VOC CCV associated with analytical batch 187499 recovered above the upper control limit (± 20% recovery or drift) for 4-methyl-2-pentanone (31.1%) and 2-hexanone (24.6%). All associated project samples were reanalyzed with analytical batch 187506 for 4-methyl-2-pentanone and 2-hexanone with acceptable batch QC; 4-methyl-2-pentanone and 2-hexanone results are reported from the reanalysis.

The minimum RFs for n-nitrosodi-n-propylamine, isophorone, and bis(2-chloroethoxy)methane were below the lower control limit in the CCV sample associated with SVOC analytical batch 186869. Consequently, the results of the aforementioned analytes in samples 15FWOU401WG through 15FWOU416WG were qualified (J-) as potential low estimates. Although the results for isophorone and bis(2-chloroethoxy)methane are potentially low-biased and are non-detect or at trace concentrations, impact to data quality is negligible as the RF failures are not significant and the LODs are three orders of magnitude less than the ADEC cleanup level or a cleanup level has not been established. All results for n-nitrosodi-n-propylamine are also non-detect, but the LODs are slightly greater than the cleanup level. However, n-nitrosodi-n-propylamine is not a site contaminant of concern and the inadequate sensitivity for its analysis was identified in the work plan.

The SVOC CCV associated with analytical batch 186869 recovered marginally above the upper control limit (± 20% recovery or drift) for hexachlorocyclopentadiene (+20.4%). Hexachlorocyclopentadiene was non-detect in associated samples, so data qualification due to the high-biased recovery was not necessary.

During the initial analysis of VOC samples 15FWOU407WG and 15FWOU409WG, a saturation of target analytes 1,1,2,2-tetrachlorethane, trichloroethene, and cis-1,2-dichloroethene was observed. To support the initial analysis, the samples were diluted and reanalyzed one day outside of the method holding time (the results in which were reported as secondary). Due to the saturation of the analytes in the initial run, the results are qualified (J) as potential estimates of unknown bias. The impact to the project is likely negligible as the results are consistent with the concentration ranges observed for these wells since at least 2007 (AP-5588 and AP-5589, respectively); analytes that have either consistently exceeded the cleanup level or that have consistently been less than the cleanup continue to do so for both affected wells in this data set.

c. Were all corrective actions documented?

☐✓Yes No ☐NA (Please explain.) Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Case narrative does not discuss effect on data quality, it only discusses discrepancies and what was done in light of them. Any notable data quality issues mentioned in the case narrative are discussed above in 4b or elsewhere within this ADEC checklist.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☐✓Yes No ☐NA (Please explain.) Comments:

b. All applicable holding times met?

☐✓Yes No ☐NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

☐Yes No ☐✓NA (Please explain.) Comments:

No soil samples were included in this report.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☐Yes ✓No ☐NA (Please explain.) Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable cleanup level for non-detect results. Two VOC analytes (1,2,3-trichloropropane and 1,2-dibromoethane (EDB)), one SVOC analyte (n-nitrosodi-n-propylamine) and one metal (thallium) analyzed by methods SW8260C, SW8270D, and SW6020A, respectively, did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345 in all project samples. Therefore, the aforementioned analytes may not be detected, if present, at the respective cleanup level. The affected VOC and SVOC analytes are not site contaminants of concern and the inadequate analytical sensitivity for these analytes were identified in the work plan, so impact to the project is negligible. Although the analysis of thallium is a requirement of the landfill permit, impact to the project is likely negligible as thallium has been non-detected or detected only at trace concentrations at this site since 1997.

Non-detect analytes with LODs reported above cleanup levels are identified with gray highlight in the analytical results table (Table C-2)

e. Data quality or usability affected?

Comments:

See discussion above in 5d.

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☐✓Yes No ☐NA (Please explain.) Comments:

ii. All method blank results less than PQL?

☐ ✓Yes No ☐NA (Please explain.) Comments:

No method blank results were above the LOQ; however, one analyte did have detections below the LOQ.

Methylene chloride was detected in the method blank sample contained in extraction batch 187340 at a concentration below the LOQ (report 580-48876). Methylene chloride (a common laboratory contaminant) was detected at concentrations less than ten-times that of the method blank in associated samples 15FWOU401WG through 15FWOU407WG, 15FWOU409WG, and trip blank sample 15FWOU417WQ. These results were qualified (B) as potential laboratory cross-contamination. Impact to project data is negligible as the methylene chloride detections were less than the ADEC cleanup level.

iii. If above PQL, what samples are affected?

Comments:

See discussion above in 6aii.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

v. Data quality or usability affected? (Please explain.)

Comments:

See discussion above in 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☐Yes ✓No ☐NA (Please explain.) Comments:

No project MS/MSD was reported in VOC extraction batch 187340. Potential matrix interference in this batch could not be evaluated; however, accuracy was assessed from LCS recovery and precision was evaluated from the LCS/LCSD RPD. The batch contained the following 7 project samples and 1 trip blank: 15FWOU401WG through 15FWOU407WG, 15FWOU409WG, and trip blank sample 15FWOU417WQ.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐✓Yes No ☐NA (Please explain.) Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

See discussion in 6bv below.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

See discussion in 6bv below.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The VOC LCS/LCSD sample contained in extraction batch 187499 had an acetone RPD (25%) that exceeded the criterion (20%) (report 580-48876). The individual LCS and LCSD recoveries met the acceptance criterion. Acetone was not detected in associated samples so qualifications were not applied.

The VOC MSD prepared from sample 15FWOU413WG recovered marginally below the lower control limit (77%) for sec-butylbenzene (76%) (report 580-48876). Consequently, the sec-butylbenzene result of the parent sample and associated field duplicate sample (15FWOU414WG) was qualified (J-) as a potential low estimate. Impact to data quality is negligible as the failure was marginal, the MS recovery was within limits, and the affected result is more than two orders of magnitude less than the ADEC cleanup level.

The SVOC MS and MSD prepared from sample 15FWOU411WG recovered below the lower control limit for 4-nitroanaline (45%/53% vs. 70%), 3,3’-dichlorobenzidine (0%/0% vs. 27%), and bis(2-ethylhexyl)phthalate (-32%/-11% vs. 55%) (report 580-48876). 4-Nitroanaline also exceeded the RPD criterion due to the recovery failures. Consequently, the 4-nitroanaline result of the parent sample as associated field duplicate sample (15FWOU412WG) was qualified (J-) as a potential low estimate. Impact to the project was negligible as the analyte does not have an established ADEC cleanup level. The 3,3’-dichlorobenzidine result was rejected (qualified ‘R’) in the field duplicate pair as the result was non-detect and the recoveries were <10%. Impact to the project is negligible as the analyte is not a site contaminant of concern. The recovery criteria was not applicable for bis(2-ethylhexyl)phthalate as the sample result was greater than the spike concentrations. Additionally, the following analytes exceeded the MS/MSD RPD criterion: 1,3-dichlorobenzene (21%), 4-nitroaniline (27%), hexachloroethane (21%), benzoic acid (39%), hexachlorobutadiene (22%), hexachlorocyclopentadiene (59%), 4-nitrophenol (36%), 4,6-dinitro-2-methylphenol (25%), N-nitrosodiphenylamine (28%), hexachlorobenzene (23%), anthracene (21%), and benzo[k]fluoranthene (24%). These aforementioned analytes were all non-detect in the parent sample so qualifications were not applied.

The SVOC MS and/or MSD prepared from sample 15FWOU413WG recovered below the lower control limit for phenol (64% vs. 65%), benzoic acid (-3% vs. 20%), 4-chloroanaline (28% vs. 33%), 3-nitroanaline (35%/27% vs. 41%), 4-nitroanaline (42%/39% vs. 70%), and 3,3'-dichlorobenzidine (0%/0% vs. 27%) (report 580-48876). Benzoic acid and 3-nitroanaline also exceeded the RPD criterion due to the recovery failures. Consequently, the results for the aforementioned analytes (except for 3,3'-dichlorobenzidine) of the parent sample and associated field duplicate sample (15FWOU414WG) were qualified (J-) as potential low estimates. Impact to the project was negligible as the analytes are non-detect with LODs a minimum of four orders of magnitude less than the ADEC cleanup level or do not have an established ADEC cleanup level. The 3,3'-dichlorobenzidine result was rejected (qualified 'R') in the field duplicate pair as the result was non-detect and the recoveries were less than 10%. Impact to the project is negligible as the analyte is not a site contaminant of concern. In addition, the MS/MSD recovered above the upper control limit for 4-nitrophenol (188%/175% vs. 145%); however, the analyte was not detected in the parent sample so no data were qualified. The MS sample recovered below the lower limit and the MSD recovered above the upper limit for bis(2-ethylhexyl)phthalate, but the recovery criteria were not applicable as the sample result was greater than the spike concentrations. Bis(2-ethylhexyl)phthalate also exceeded the MS/MSD RPD criterion but no data were qualified because the concentration in the parent sample was non detect.

The MS/MSD samples prepared from 15FWOU411WG and 15FWOU413WG exceeded the recovery criteria for methane (report 580-48876). The methane results of the parent samples were greater than the spike concentrations, so recovery criteria were not applicable.

Antimony marginally exceeded the RPD criterion (20%) for the laboratory duplicate of sample 15FWOU411WG (21%). Consequently, the antimony result for this sample was qualified (J) as a potential estimate due to imprecision. The impact to data quality is negligible as the RPD exceedance is marginal and the result is one order of magnitude less than the ADEC cleanup level. Moreover, a field duplicate sample (15FWOU412WG) was also collected on this well (AP-8063) and the field duplicate sample pair had an acceptable RPD value.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

See discussion above in 6biii.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☐✓Yes No ☐NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☐✓Yes No ☐NA (Please explain.) Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐Yes No ☐✓NA (Please explain.) Comments:

All recoveries were acceptable. Qualifications were not necessary.

iv. Data quality or usability affected? (Use the comment box to explain.)

Comments:

All recoveries were acceptable. Qualifications were not necessary.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☐✓Yes No ☐NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☐✓Yes No ☐NA (Please explain.) Comments:

Trip blank sample 15FWOU417WQ was included in cooler 040901.

iii. All results less than PQL?

☐✓Yes No ☐NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, methylene chloride was detected in trip blank sample 15FWOU417WQ at a concentration below the LOQ. The detection was associated with laboratory cross-contamination as discussed in the Method Blank section (6aii) of this review. No further qualifications were applied.

iv. If above PQL, what samples are affected?

Comments:

No samples are affected by the detection in the trip blank sample because the detection is associated with method blank contamination (see discussion above in 6diii).

v. Data quality or usability affected? (Please explain.)

Comments:

Data quality was not affected due to trip blank contamination (see discussion above in 6diii).

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?
☐✓Yes No ☐NA (Please explain.) Comments:

Two field duplicate samples were collected for the thirteen groundwater primary samples associated with this work order.

ii. Submitted blind to lab?
☐✓Yes No ☐NA (Please explain.) Comments:

Sample 15FWOU412WG was a field duplicate of 15FWOU411WG (Landfill).
Sample 15FWOU414WG was a field duplicate of 15FWOU413WG (CAT Shed [Bldg 1191] Leach Field).

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $$\frac{(R_1-R_2)}{((R_1+R_2)/2)} \text{ x } 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐✓Yes No ☐NA (Please explain.) Comments:

All results for the field duplicate sample pair 15FWOU411WG/15FWOU412WG were comparable (RPD ≤ 30%), with the exception of methane, cadmium, selenium, silver, thallium, and bis(2-ethylhexyl)phthalate. If detected, the results for cadmium, selenium, silver, and thallium were less than the LOQ and are considered estimated values (J flagged), so no additional flagging was applied. The methane and bis(2-ethylhexyl)phthalate results of the field duplicate pair (identified in gray highlight) were qualified (J) as estimates due to imprecision. Impact to bis(2-ethylhexyl)phthalate data quality is likely negligible as the affected results are within the concentration range observed for this well (AP-8063) and both results are below the ADEC cleanup level. Bis(2-ethylhexyl)phthalate has exceeded the cleanup level in this well in 2011 (15 µg/L) and 2006 (7.4 µg/L), and monitoring of this analyte will continue. The methane results are similar to historic concentrations, and the analyte is not a site contaminant of concern and does not have an established ADEC cleanup level.

All results for the field duplicate sample pair 15FWOU413WG/15FWOU414WG were comparable (RPD ≤ 30%), with the exception of lead, di-n-butyl phthalate, nitrobenzene, bis(2-chloroethoxy)methane, and bis(2-ethylhexyl)phthalate. If detected, the results of lead, di-n-butyl phthalate, nitrobenzene, and bis(2-chloroethoxy)methane were less than the LOQ and are considered estimated values (J flagged), so no additional flagging was applied. The bis(2-ethylhexyl)phthalate results of the field duplicate pair were qualified (J) as estimates due to imprecision. Impact to data quality is likely negligible as the affected results are below the ADEC cleanup level and this analyte has not historically exceeded the cleanup level in this well (AP-10257MW) since sampling began in 2012.

All detected results for the primary and field duplicate samples are shown in the tables below. Non-detect results are also presented for contaminants of concern (only). In the case where a result was detected in one sample but non-detect in the other, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated using LODs but the comparison criterion is not applicable. Units are mg/L for sulfate and µg/L for remaining analytes.

Analyte	**Method**	**15FWOU411WG (primary)**	**Qualifier**	**15FWOU412WG (Field Duplicate)**	**Qualifier**	**RPD**	**Comparison Criteria Met?**
Sulfate	E300.0	4.6		4.3		7	Yes
Methane	RSK175	2100		1500		33	No
Iron	SW6010C	23000		24000		4	Yes
Antimony	SW6020A	0.63	J	0.55	J	14	Yes
Arsenic	SW6020A	4.3	J	4.2	J	2	Yes

Barium	SW6020A	140		140		0	Yes
Beryllium	SW6020A	ND [1.3]		ND [1.3]		0	Yes
Cadmium	SW6020A	ND [0.3]		0.22	J	31	Not Applicable
Chromium	SW6020A	4.6		5.4		16	Yes
Cobalt	SW6020A	1	J	0.98	J	2	Yes
Copper	SW6020A	5.9	J	5.7	J	3	Yes
Lead	SW6020A	3.7		3.7		0	Yes
Nickel	SW6020A	3.7	J	4.2	J	13	Yes
Selenium	SW6020A	ND [4]		ND [0.35]		168	Not Applicable
Silver	SW6020A	ND [0.35]		ND [2.5]		151	Not Applicable
Thallium	SW6020A	ND [2.5]		ND [10]		120	Not Applicable
Vanadium	SW6020A	7.9	J	8.5	J	7	Yes
Zinc	SW6020A	38		41		8	Yes
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.5]		ND [0.5]		0	Yes
1,1,2-Trichloroethane	SW8260C	ND [0.5]		ND [0.5]		0	Yes
Trichloroethene (TCE)	SW8260C	0.78	J	0.72	J	8	Yes
Vinyl chloride	SW8260C	ND [0.5]		ND [0.5]		0	Yes
cis-1,2-Dichloroethene	SW8260C	4.5		4.6		2	Yes
bis-(2-Ethylhexyl)phthalate	SW8270D	2.8	J	5.7		68	No

Analyte	Method	15FWOU413WG (primary)	Qualifier	15FWOU414WG (Field Duplicate)	Qualifier	RPD	Comparison Criteria Met?
Sulfate	E300.0	22		23		4	Yes
Methane	RSK175	2300		2500		8	Yes
Iron	SW6010C	2400		2500		4	Yes
Antimony	SW6020A	1.3	J	1.1	J	17	Yes
Arsenic	SW6020A	1.5	J	1.6	J	6	Yes
Barium	SW6020A	160		170		6	Yes
Beryllium	SW6020A	ND(1.3)		ND(1.3)		0	Yes
Cadmium	SW6020A	0.32	J	0.38	J	17	Yes
Chromium	SW6020A	2.2		2		10	Yes
Cobalt	SW6020A	22		23		4	Yes
Copper	SW6020A	9.9	J	8.1	J	20	Yes
Lead	SW6020A	0.19	J	ND(0.5)		90	Not Applicable
Nickel	SW6020A	60		66		10	Yes
Selenium	SW6020A	ND(4)		ND(4)		0	Yes
Silver	SW6020A	ND(0.35)		ND(0.35)		0	Yes
Thallium	SW6020A	ND(2.5)		ND(2.5)		0	Yes
Vanadium	SW6020A	ND(10)		ND(10)		0	Yes
Zinc	SW6020A	30	J	35		15	Yes
1,1,2,2-Tetrachloroethane	SW8260C	ND(0.5)		ND(0.5)		0	Yes
1,1,2-Trichloroethane	SW8260C	ND(0.5)		ND(0.5)		0	Yes
4-Isopropyltoluene	SW8260C	ND(2)		1.7	J	16	Yes
Benzene	SW8260C	14		14		0	Yes
Isopropylbenzene	SW8260C	0.65	J	0.69	J	6	Yes
Trichloroethene (TCE)	SW8260C	ND(1)		ND(1)		0	Yes
Vinyl chloride	SW8260C	ND(0.5)		ND(0.5)		0	Yes
Xylene, Isomers m & p	SW8260C	0.34	J	0.33	J	3	Yes
cis-1,2-Dichloroethene	SW8260C	3.1		3.3		6	Yes

cis-1,3-Dichloropropene	SW8260C	ND(0.5)		ND(0.5)		0	Yes
sec-Butylbenzene	SW8260C	0.74	J	0.71	J	4	Yes
trans-1,2-Dichloroethene	SW8260C	0.51	J	0.57	J	11	Yes
3/4-Methylphenol Coelution	SW8270D	0.12	J	0.1	J	18	Yes
Benzoic acid	SW8270D	9.9		7.9		22	Yes
Benzyl butyl phthalate	SW8270D	0.24	J	0.32	J	29	Yes
Di-n-butyl phthalate	SW8270D	0.12	J	0.33	J	93	Not Applicable
Nitrobenzene	SW8270D	ND(0.19)		0.13	J	38	Not Applicable
Phenol	SW8270D	0.55	J	0.56	J	2	Yes
bis-(2-Chloroethoxy)methane	SW8270D	ND(0.19)		0.12	J	45	Not Applicable
bis-(2-Ethylhexyl)phthalate	SW8270D	2.1	J	4.1		65	No

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No data quality or usability was affected by the field duplicates.

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes No ☐✓NA (Please explain.) Comments:

No equipment blank was required because the wells were sampled with a peristaltic pump employing dedicated Teflon-lined tubing at each well.

i. All results less than PQL?

☐Yes ☐ No ☐✓NA (Please explain.) Comments:

No equipment blank was required.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

iii. Data quality or usability affected? (Please explain.)

Comments:

Not applicable.

7. <u>Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)</u>

a. Defined and appropriate?

✓Yes No ☐NA (Please explain.) Comments:

Sample results reported below the LOQ are flagged (J) as estimated values.

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed by: Vanessa Ritchie

Title: Project Chemist

Date: 01/04/2016

CS Report Name: Fort Wainwright Operable Unit 4

Report Date: 12/30/2015

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: TestAmerica Laboratories, Inc. Seattle, Washington

Laboratory Report Number: 580-54924

ADEC File Number: 108.38.070.03

ADEC RecKey Number:

1. Laboratory
    a. Did an ADEC CS approved laboratory receive and <u>perform</u> all of the submitted sample analyses?
    ☐✓Yes No ☐NA (Please explain.) Comments:

    Yes; however, EPA Methods 300.0 and RSK-175 are not listed as CS analyses.

    b. If the samples were transferred to another “network” laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
    ☐Yes No ☐✓NA (Please explain.) Comments:

    Methane analysis via RSK-175 was subcontracted to TestAmerica of Denver, Colorado. The ADEC CS program does not certify for the RSK-175 method. However, the laboratory holds an ELAP certification for the analysis.

2. Chain of Custody (COC)
    a. COC information completed, signed, and dated (including released/received by)?
    ☐✓Yes No ☐NA (Please explain.) Comments:

    b. Correct analyses requested?
    ☐✓Yes No ☐NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
    a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
    ☐ Yes ✓No ☐NA (Please explain.) Comments:

    Coolers 110901, 110902, and 110903 arrived at the laboratory with a temperature blank reading below the acceptable range at 0.7°C, 1.3°C, and 0.9°C, respectively. Since the samples were reportedly received in good condition and the temperatures were above freezing, no data were qualified.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☐✓Yes No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☐✓Yes No ☐NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

☐✓Yes No ☐NA (Please explain.) Comments:

The laboratory noted the temperature blanks arriving outside the recommended temperature range, as discussed above.

e. Data quality or usability affected? (Please explain.)

Comments:

No data were impacted due to low temperatures.

4. Case Narrative

a. Present and understandable?

☐✓Yes No ☐NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☐✓Yes No ☐NA (Please explain.) Comments:

The case narrative described method blank contamination, MS/MSD discrepancies, and LCS discrepancies, which are discussed below in 6aii, 6biii, and 6biv, respectively. It also described CCV discrepancies and the re-analysis of select VOC and SVOC samples, which are discussed here. CCV discrepancies for analytes not reported in this SDG are not discussed.

One VOC sample (15FWOU422WG; batch 206259) and five SVOC samples (15FWOU418WG through 15FWOU422WG; batch 208232) were re-extracted and re-analyzed 3 and 32 days outside of method holding times, respectively, due to QC issues associated with the initial runs. Since the initial runs were performed within holding time, these results are reported as primary and were qualified as appropriate due to QC discrepancies. In all but one case (discussed on the following page), the results of the two runs are similar (most analytes are non-detect with a few at trace concentrations of one to five orders of magnitude less than ADEC cleanup levels). The case narrative describes CCV discrepancies associated with the VOC and SVOC re-analysis batches; however, these discrepancies are not discussed here as the results are considered secondary.

As stated above, the results of the VOC and SVOC initial and re-analysis runs are similar, with the exception of the bis(2-ethylhexyl)phthalate results for field duplicate sample 15FWOU421WG. The result in the initial run exceeded the ADEC cleanup level (6 µg/L) at a concentration of 14 µg/L, and the result from the re-analysis run was non-detect (LOD = 2.2 µg/L). The bis(2-ethylhexyl)phthalate results of the initial and re-analysis runs for the primary sample (15FWOU420WG) were both non-detect. Since bis(2-ethylhexyl)phthalate has not previously exceeded the cleanup level in this well (AP-10257MW), and since both results for the primary sample were non-detect, it is assumed that the elevated concentration of the field duplicate sample from the initial run is erroneous. However, the results from the initial run are reported as primary as the samples from the re-analysis were extracted 32 days outside of holding time. Moreover, a high-biased LCS recovery of bis(2-ethylhexyl)phthalate is associated with the initial analytical batch, which further suggests that the bis(2-ethylhexyl)phthalate result for 15FWOU421WG is high-biased. Consequently, the result was qualified (J+), as further discussed in section 6bv.

The VOC CCV associated with analytical batch 206058 recovered above the upper control limit (± 20% recovery or drift) for dichlorodifluoromethane (+70.9%), chloromethane (+23.9%), vinyl chloride (+28.7%), bromomethane (+28.9%), acetone (+35.6%), and 2-butanone (+26.5%). Additionally, the ending CCV for this batch recovered above the upper control limit for dichlorodifluoromethane (+98.6%). The aforementioned analytes were non-detect in associated samples, so data qualification due to the high-biased recovery was not applicable.

The VOC CCV associated with analytical batch 206157 recovered above the upper control limit (± 20% recovery or drift) for dichlorodifluoromethane (+31.8%) and acetone (+25.3%). The aforementioned analytes were non-detect in associated samples, so data qualification due to the high-biased recovery was not applicable.

The SVOC ending CCV associated with analytical batch 206278 recovered below the lower control limit (± 50% recovery or drift) for 2,4-dinitrophenol (-75.9%) and 4,6-dinitro-2-methyphenol (-54.7%). Consequently, there analytes were qualified (J-) in associated samples 15FWOU418WG through 15FWOU422WG. Although the affected results are non-detected and potentially low-biased, impact to the project is negligible as analytes had acceptable recoveries in the CCV sample, plus neither analyte is a site contaminant of concern.

c. Were all corrective actions documented?

☐✓Yes No ☐NA (Please explain.) Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Case narrative does not discuss effect on data quality, it only discusses discrepancies and what was done in light of them. Any notable data quality issues mentioned in the case narrative are discussed above in 4b or elsewhere within this ADEC checklist.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☐✓Yes No ☐NA (Please explain.) Comments:

b. All applicable holding times met?

☐✓Yes No ☐NA (Please explain.) Comments:

All primary data from analytical batches were performed within holding times. One VOC and one SVOC re-analysis batches were performed 2 and 32 days outside of holding time, respectively; however, the results from these batches are reported as secondary. See 4b for further discussion.

c. All soils reported on a dry weight basis?

☐Yes No ☐✓NA (Please explain.) Comments:

No soil samples were included in this report.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☐Yes ✓No ☐NA (Please explain.) Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable cleanup level for non-detect results. Two VOC analytes (1,2,3-trichloropropane and 1,2-dibromoethane (EDB)), one SVOC analyte (n-nitrosodi-n-propylamine) and one metal (thallium) analyzed by methods SW8260C, SW8270D, and SW6020A, respectively, did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345 in all project samples. Therefore, the aforementioned analytes may not be detected, if present, at the respective cleanup level. The affected VOC and SVOC analytes are not site contaminants of concern and the inadequate analytical sensitivity for these analytes were identified in the work plan, so impact to the project is negligible. Although the analysis of thallium is a requirement of the landfill permit, impact to the project is likely negligible as thallium has been non-detected or detected only at trace concentrations at this site since 1997.

Non-detect analytes with LODs reported above cleanup levels are identified with gray highlight in the analytical results table (Table C-2)

e. Data quality or usability affected?

Comments:

See discussion above in 5d.

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☐✓Yes No ☐NA (Please explain.) Comments:

ii. All method blank results less than PQL?

☐ ✓Yes No ☐NA (Please explain.) Comments:

No method blank results were above the LOQ; however, a few analytes did have detections below the LOQ.

Benzyl butyl phthalate, di-n-butyl phthalate, and diethyl phthalate were detected in the method blank sample contained in SVOC extraction batch 205525 at concentrations below the LOQ (report 580-54924). These analytes were detected in the samples listed below at concentrations less than five-times that of the method blank and were qualified (B) as potential laboratory cross-contamination. Impact to results is negligible as the affected results are approximately four orders of magnitude less than the ADEC cleanup level.

- benzyl butyl phthalate: 15FWOU421WG
- di-n-butyl phthalate: 15FWOU421WG
- diethyl phthalate: 15FWOU418WG through 15FWOU422WG

Methylene chloride and naphthalene were detected in the method blank sample contained in VOC extraction batch 20658 at concentrations below the LOQ (report 580-54924). These analytes were detected in the samples listed below at concentrations less than five-times (ten-times for methylene chloride) that of the method blank and were qualified (B) as potential laboratory cross-contamination. Impact to results is negligible as the affected results are less than the ADEC cleanup level.

- methylene chloride: trip blank sample 15FWOU423WQ
- naphthalene: 15FWOU418WG, 15FWOU420WG, and trip blank sample 15FWOU423WQ

iii. If above PQL, what samples are affected?

Comments:

See discussion above in 6aii.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

v. Data quality or usability affected? (Please explain.)

Comments:

See discussion above in 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

No project MS/MSD was reported in VOC extraction batch 206157. Potential matrix interference in this batch could not be evaluated; however, accuracy was assessed from the LCS recovery and precision was evaluated from the LCS/LCSD RPD. The batch contained the following 4 project samples: 15FWOU418WG (trans-1,2-dichloroethene and cis-1,2-dichloroethene only), 15FWOU419WG, 15FWOU421WG, and 15FWOU422WG.

☐Yes ✓No ☐NA (Please explain.) Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐✓Yes No ☐NA (Please explain.) Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

See discussion in 6bv below. Discrepancies associated with secondary data (re-analysis VOC batch 206259 and SVOC batch 208232) are not discussed.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

See discussion in 6bv below. Discrepancies associated with secondary data (re-analysis VOC batch 206259 and SVOC batch 207870) are not discussed.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The VOC LCS and/or LCSD sample contained in extraction batch 206058 recovered above the upper control limit for dichlorodifluoromethane (188%/217% vs. 152%), vinyl chloride (148% vs. 137%), carbon disulfide (136% vs. 133%), methylene chloride (132% vs. 124%), trans-1,2-dichloroethene (132% vs. 124%), cis-1,2-dichloroethene (124% vs. 123%), 1,1,1-trichloroethane (132% vs. 131%), 1,1,2-trichloroethane (120% vs. 119%), chlorobenzene (119%/119% vs. 118%), n-propylbenzene (131% vs. 126%), 2-chlorotoluene (125% vs. 122%), 4-chlorotoluene (129% vs. 122%), and 1,3-dichlorobenzene (121% vs. 119%) (report 580-54924). Additionally, the following analytes had RPD values greater than the control limit (20%), but had acceptable LCS and LCSD recoveries: acetone (26%), 2-butanone (33%), 4-methyl-2-pentanone (34%), 2-hexanone (29%), 1,1,2,2-tetrachloroethane, and 1,2-dibromo-3-chloropropane (28%) (report 580-54924). All aforementioned analytes were non-detect in associated samples so no data qualifications were applied.

The VOC LCS and LCSD sample contained in extraction batch 206157 recovered above the upper control limit for dichlorodifluoromethane (168%/193% vs. 152%) and the following analytes had RPD values greater than the control limit (20%), but had acceptable LCS and LCSD recoveries: acetone (36%), 2-butanone (40%), 4-methyl-2-pentanone (35%), 2-hexanone (29%), 1,1,2,2-tetrachloroethane (22%), and 1,2-dibromo-3-chloropropane (33%) (report 580-54924). All aforementioned analytes were non-detect in associated samples so no data qualifications were applied.

The SVOC LCS and/or LCSD sample contained in extraction batch 205525 recovered outside control limits for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-54924). Low recoveries were noted for 4-nitroaniline (62%/59% vs. 70%), 4,6-dinitro-2-methylphenol (24%/35% vs. 44%), anthracene (46%/44% vs. 57%), 3,3'-dichlorobenzidine (3%/2% vs. 27%), 2,4-dimethylphenol (24% vs. 31%), 4-chloroaniline (2%/1% vs. 33%), hexachlorocyclopentadiene (14%/14% vs. 20%), and 3-nitroaniline (38%/10% vs. 41%). All results for 3,3'-dichlorobenzidine and 4-chloroaniline in associated samples (15FWOU418WG through 15FWOU422WG) were rejected (qualified "R") due to recoveries below 10%. Neither analyte is a site contaminant of concern so impact to the project is negligible. The remaining aforementioned analytes (4-nitroaniline, 4,6-dinitro-2-methylphenol, anthracene, 2,4-dimethylphenol, hexachlorocyclopentadiene, and 3-nitroaniline) were qualified (J-) in associated samples (15FWOU418WG through 15FWOU422WG) as potential low estimates; however, impact to the project is negligible as the results are either non-detect with LODs two to five orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. High recoveries were noted for butyl benzyl phthalate (150% vs. 134%) and bis(2-ethylhexyl)phthalate (204% vs. 135%). Consequently, detected analytes were qualified (J+) as high estimates in associated project samples, which included the butyl benzyl phthalate result for sample 15FWOU421WG and the bis(2-ethylhexyl)phthalate result for samples 15FWOU421WG and 15FWOU422WG. Impact to the potentially high-biased butyl benzyl phthalate result for sample 15FWOU421WG and the bis(2-ethylhexyl)phthalate result for sample 15FWOU422WG is negligible as the results are less than the cleanup levels. However, the high-biased bis(2-ethylhexyl)phthalate LCS recovery may have adversely impacted the result for sample 15FWOU421WG, which was detected at a concentration (14 µg/L) exceeding the ADEC cleanup level (6 µg/L). Moreover, sample 15FWOU421WG is a field duplicate of primary sample 15FWOU420WG and bis(2-ethylhexyl)phthalate was non-detect in the primary sample. Additionally, 2,4-dinitrophenol (35%) and 2-nitrophenol (27%) had RPD values greater than the control limit (20%), but had acceptable LCS and LCSD recoveries. Neither analyte was detected in associated samples so no data qualifications were applied.

The VOC MS and/or MSD prepared from sample 15FWOU420WG recovered above the upper control limit for several analytes (see pages 89 and 90 of PDF report 580-48876). However, with the exception of the four analytes discussed below, these analytes were not detected in the parent sample, so no data qualifications were applied. The elevated recoveries of benzene (153%/129% vs. 120%), cis-1,2-dichloroethene (154%/130% vs. 123%), toluene (144%/122% vs. 121%), and naphthalene (132% vs. 128%) resulted in qualification ("J+"-flags) of the detected concentrations in the parent sample and associated field duplicate sample (15FWOU421WG) (note that naphthalene was not detected in the field duplicate sample). With the exception of benzene, the affected results were potentially high-biased and several times below ADEC cleanup levels, so impact to the project is negligible. The impact to benzene data is also negligible as benzene has exceeded the ADEC cleanup level in this well (AP-10257MW) during five out of six sampling events since the well was installed in 2012.

The thallium MS prepared from sample 15FWOU420WG recovered above the upper control limit (report 580-54924). However, since the sample result was non-detect for thallium, no data qualification was applied.

The SVOC MS and/or MSD prepared from sample 15FWOU420WG recovered outside control limits for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-54924). Low recoveries were noted for 2,4-dimethylphenol (26%/29% vs. 31%), 3-nitroaniline (0%/0% vs. 41%), 4-nitroaniline (18%/11% vs.70%), anthracene (34%/38% vs. 57%), 3,3’-dichlorobenzidine (0%/0% vs. 27%), benzo(a)pyrene (37%/42% vs. 54%), dibenz(a,h)anthracene (47% vs. 51%), and benzo(g,h,i)perylene (49% vs. 50%). The 4-nitroaniline and 3,3’-dichlorobenzidine results in the parent sample and associated field duplicate (15FWOU421WG) have been rejected due to LCS/LCSD recovery discrepancies, as discussed above. Moreover, the 3-nitroaniline results in these samples are rejected (qualified “R”) due to MS/MSD recoveries below 10%. The remaining analytes exhibiting low MS/MSD recoveries (2,4-dimethylphenol, anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene) were qualified (J-) as potential low estimates in the parent sample and associated field duplicate sample (15FWOU421WG). The impact to data quality is likely negligible as the affected results are either non-detect with LODs one to five orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. High MS and/or MSD recoveries were noted for benzoic acid (178%/170% vs. 140%), pentachlorophenol (145%/146% vs. 138%), di-n-butyl phthalate (136% vs. 127%), butyl benzyl phthalate (158%/156% vs. 134%), and bis(2-ethylhexyl)phthalate (147% vs. 135%). Pentachlorophenol was not detected in the parent or field duplicate sample, so no data qualifications were applied. The detected results for the remaining analytes in the parent sample and/or associated field duplicate sample were qualified (J+) as potential high-estimates as follows: 15FWOU420WG (benzoic acid) and 15FWOU421WG (di-n-butyl phthalate, butyl benzyl phthalate, and bis(2-ethylhexyl)phthalate). Impact to the benzoic acid, di-n-butyl phthalate, and butyl benzyl phthalate data is negligible as the affected results are a minimum of four orders of magnitude less than ADEC cleanup levels. However, the affected bis(2-ethylhexyl)phthalate result is more than two times the ADEC cleanup level. Note that the batch also contained a high-biased LCS recovery of bis(2-ethylhexyl)phthalate, which was further discussed on the previous page. Additionally, 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol had RPD values greater than the control limit (20%), but had acceptable MS and MSD recoveries. Neither analyte was detected in associated samples so no data qualifications were applied.

The methane MS and MSD prepared from sample 15FWOU420WG recovered outside the control limits (report 580-54924). However, the sample result was greater than the spike concentration so recovery criteria were not applicable. No data qualifications were applied.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

See discussion above in 6biii.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☐✓Yes No ☐NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

VOC surrogate 1,2-dichloroethane-d4 recovered below control limits (81-119%) in sample 15FWOU422WG (77%) (report 580-54924). Consequently, all VOCs in the sample were qualified (J-) due to the low surrogate recovery. Impact to the data is likely negligible as the failure was marginal, 4 of 5 surrogates had acceptable recoveries, and VOC results are consistent with recent concentrations for this well (AP-6530).

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

iv. Data quality or usability affected? (Use the comment box to explain.)

Comments:

See discussion above in 6cii.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☐✓Yes No ☐NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☐✓Yes No ☐NA (Please explain.) Comments:

Trip blank sample 15FWOU423WQ was included in cooler 110901.

iii. All results less than PQL?

☐✓Yes No ☐NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, methylene chloride and naphthalene were detected in trip blank sample 15FWOU423WQ at concentrations equal to or below the LOQ. The detections were associated with laboratory cross-contamination as discussed in the Method Blank section (6aii) of this review. No further qualifications were applied.

iv. If above PQL, what samples are affected?

No samples are affected by the detection in the trip blank sample because the detection is associated with method blank contamination (see discussion above in 6diii).

Comments:

v. Data quality or usability affected? (Please explain.)

Comments:

Data quality was not affected due to trip blank contamination (see discussion above in 6diii).

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☐✓Yes No ☐NA (Please explain.) Comments:

One field duplicate sample was collected for the four primary groundwater samples associated with this work order.

ii. Submitted blind to lab?

☐✓Yes No ☐NA (Please explain.) Comments:

Sample 15FWOU421WG was a field duplicate of 15FWOU420WG (AP-10257MW).

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$\text{RPD (\%) = Absolute value of: } \frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

☐Yes ✓No ☐NA (Please explain.) Comments:

All results for the field duplicate sample pair 15FWOU420WG/15FWOU421WG were comparable (RPD ≤ 30%), with the exception of benzene, naphthalene, toluene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, benzyl butyl phthalate, phenol, and bis(2-ethylhexyl)phthalate. The results for toluene, trans-1,2-dichloroethene, and phenol in both samples were less than the LOQ and are considered estimated values (J-flagged), so no additional flagging was applied. The detected naphthalene result in the primary sample is attributed to method blank contamination, so no additional flagging was applied. The remaining analytes (benzene, cis-1,2-dichloroethene, benzyl butyl phthalate, and bis-(2-ethylhexyl)phthalate) were qualified (J) as potential estimates due to imprecision. The imprecision of all four analytes may be due to matrix interference as suggested by the high-biased MS/MSD recoveries. Moreover, high-biased LCS recoveries were noted for benzyl butyl phthalate and bis-(2-ethylhexyl)phthalate, as discussed in section 6bv.

All detected results for the primary and field duplicate samples are shown in the table below. Non-detect results are also presented for contaminants of concern (only). In the case where a result was detected in one sample but non-detect in the other, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated using their LODs but the comparison criterion is not applicable. Units are mg/L for sulfate and µg/L for remaining analytes.

Analyte	Method	Units	15FWOU420WG (primary)	Qualifier	15FWOU421WG (Field Duplicate)	Qualifier	RPD	Comparison Criteria Met?
Sulfate	E300.0	mg/L	270		270		0	Yes
Methane	RSK175	µg/L	2700		2300		16	Yes
Iron	SW6010C	µg/L	ND(360)		ND(360)		0	Yes
Antimony	SW6020A	µg/L	1.9	J	1.8	J	5	Yes
Arsenic	SW6020A	µg/L	ND(4)		ND(4)		0	Yes
Barium	SW6020A	µg/L	200		200		0	Yes
Beryllium	SW6020A	µg/L	ND(1.3)		ND(1.3)		0	Yes
Cadmium	SW6020A	µg/L	1.1	J	0.99	J	11	Yes
Chromium	SW6020A	µg/L	1.2	J	1	J	18	Yes
Cobalt	SW6020A	µg/L	26		26		0	Yes
Copper	SW6020A	µg/L	15		15		0	Yes
Lead	SW6020A	µg/L	ND(0.5)		ND(0.5)		0	Yes
Nickel	SW6020A	µg/L	77		75		3	Yes
Selenium	SW6020A	µg/L	ND(4)		ND(4)		0	Yes
Silver	SW6020A	µg/L	ND(0.35)		ND(0.35)		0	Yes
Thallium	SW6020A	µg/L	ND(2.5)		ND(2.5)		0	Yes
Vanadium	SW6020A	µg/L	ND(10)		ND(10)		0	Yes
Zinc	SW6020A	µg/L	68		68		0	Yes
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	ND(0.50		ND(0.50)		0	Yes
1,1,2-Trichloroethane	SW8260C	µg/L	ND(0.50		ND(0.50)		0	Yes
Benzene	SW8260C	µg/L	7.4	J+	5.3	J+	33	No
Naphthalene	SW8260C	µg/L	0.60	J,B	ND(1.0)		50	Not Applicable
Toluene	SW8260C	µg/L	1.6	J,J+	1.1	J,J+	37	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	ND(1.0)		ND(1.0)		0	Yes
Vinyl chloride	SW8260C	µg/L	ND(0.50)		ND(0.50)		0	Yes
cis-1,2-Dichloroethene	SW8260C	µg/L	3.1	J+	1.9	J+	48	No
trans-1,2-Dichloroethene	SW8260C	µg/L	ND(0.50)		0.30	J	50	Not Applicable
3&4-Methylphenol Coelution	SW8270D	µg/L	0.38	J	0.51	J	29	Yes
Benzoic acid	SW8270D	µg/L	0.94	J,J+	ND(1.0)		6	Yes
Benzyl butyl phthalate	SW8270D	µg/L	ND(0.42)		0.64	J+	42	No
Di-n-butyl phthalate	SW8270D	µg/L	ND(0.21)		0.28	J,J+	29	Yes
Diethyl phthalate	SW8270D	µg/L	0.33	J	0.29	J	13	Yes
Phenol	SW8270D	µg/L	0.26	J	0.16	J	48	Not Applicable
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/L	ND(2.1)		14		148	No
Diethyl phthalate	SW8270D	µg/L	0.22	J	0.20	J	10	Yes

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

See discussion above in 6eiii.

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes No ☐✓NA (Please explain.) Comments:

No equipment blank was required because the wells were sampled with a peristaltic pump employing dedicated Teflon-lined tubing at each well.

i. All results less than PQL?

☐Yes ☐ No ☐✓NA (Please explain.) Comments:

No equipment blank was required.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

iii. Data quality or usability affected? (Please explain.)

Comments:

Not applicable.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

✓Yes No ☐NA (Please explain.) Comments:

Sample results reported below the LOQ are flagged (J) as estimated values.

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed by: Vanessa Ritchie

Title: Project Chemist

Date: 01/06/2016

CS Report Name: Fort Wainwright Operable Unit 4

Report Date: 12/18/2015

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: TestAmerica Laboratories, Inc.
Seattle, Washington

Laboratory Report Number: 580-55009

ADEC File Number: 108.38.070.03

ADEC RecKey Number:

1. Laboratory
    a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
    ☐✓Yes No ☐NA (Please explain.) Comments:

    Yes; however, EPA Methods 300.0 and RSK-175 are not listed as CS analyses.

    b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
    ☐Yes No ☐✓NA (Please explain.) Comments:

    Methane analysis via RSK-175 was subcontracted to TestAmerica of Denver, Colorado. The ADEC CS program does not certify for the RSK-175 method. However, the laboratory holds an ELAP certification for the analysis.

2. Chain of Custody (COC)
    a. COC information completed, signed, and dated (including released/received by)?
    ☐✓Yes No ☐NA (Please explain.) Comments:

    b. Correct analyses requested?
    ☐✓Yes No ☐NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
    a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
    ☐ Yes ✓No ☐NA (Please explain.) Comments:

    Coolers 111001 and 111002 arrived at the laboratory with a temperature blank reading below the acceptable range at 0.4°C and 0.3°C, respectively. Since the samples were reportedly received in good condition and the temperatures were above freezing, no data were qualified.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☐✓Yes No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☐✓Yes No ☐NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

☐✓Yes No ☐NA (Please explain.) Comments:

The laboratory noted the temperature blanks arriving outside the recommended temperature range, as discussed above.

e. Data quality or usability affected? (Please explain.)

Comments:

No data were impacted due to low temperatures.

4. Case Narrative

a. Present and understandable?

☐✓Yes No ☐NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☐✓Yes No ☐NA (Please explain.) Comments:

The case narrative described method blank contamination, as well as MS/MSD, LCS/LSCS, laboratory duplicate, surrogate, and sample holding time discrepancies, which are discussed below in 6aii, 6biii, 6biv, 6cii, and 5b, respectively. It also described CCV discrepancies, which are discussed here. CCV discrepancies for analytes not reported in this SDG are not discussed.

The VOC CCV associated with analytical batch 206157 recovered above the upper control limit (± 20% recovery or drift) for dichlorodifluoromethane (+31.8%) and acetone (+25.3%). The aforementioned analytes were non-detect in associated samples, so data qualification due to the high-biased recovery was not applicable.

The VOC CCV associated with analytical batch 206259 recovered above the upper control limit (± 20% recovery or drift) for dichlorodifluoromethane (+36.9%). Consequently, the dichlorodifluoromethane results in associated samples 15FWOU424WG and 15FWOU425WG were qualified (J+) as potential high estimates. Impact to data quality is negligible as the affected data are potentially high-biased and four orders of magnitude less than the ADEC cleanup level.

The VOC CCV associated with analytical batch 206259 recovered below the lower control limit (± 20% recovery or drift) for 4-methyl-2-pentanone (-22.6%). Consequently, the 4-methyl-2-pentanone results in associated samples 15FWOU424WG and 15FWOU425WG were qualified (J-) as potential low estimates. Impact to data quality is negligible as the failure is marginal and the affected data are non-detect with LODs three orders of magnitude less than the ADEC cleanup level. Moreover, a reporting limit standard was analyzed and the target analyte was detected.

The VOC CCV associated with analytical batch 206347 recovered above the upper control limit (± 20% recovery or drift) for dichlorodifluoromethane (+36.5%). Consequently, the dichlorodifluoromethane result in associated sample 15FWOU426WG was qualified (J+) as a potential high estimate. Impact to data quality is negligible as the affected datum is potentially high-biased and four orders of magnitude less than the ADEC cleanup level.

The VOC CCV associated with analytical batch 206347 recovered below the lower control limit (± 20% recovery or drift) for 4-methyl-2-pentanone (-22.6%) and 2-hexanone (-21.5%). Consequently, the 4-methyl-2-pentanone and 2-hexanone results in associated sample 15FWOU426WG were qualified (J-) as potential low estimates. Impact to data quality is negligible as the failure is marginal and the affected data are non-detect with an LOD three orders of magnitude less than the ADEC cleanup level or a cleanup level is not established. Moreover, a reporting limit standard was analyzed and the target analytes were detected.

The minimum response factor (RF) for n-nitrosodi-n-propylamine was below the control limit in the CCV sample associated with SVOC analytical batch 206278. Consequently, the n-nitrosodi-n-propylamine result in sample 15FWOU424WG was qualified (J-) as a potential low estimate. The affected result for n-nitrosodi-n-propylamine is non-detect and the LOD is greater than the cleanup level. However, n-nitrosodi-n-propylamine is not a site contaminant of concern and the inadequate sensitivity for its analysis was identified in the work plan.

The SVOC closing CCV associated with analytical batch 206278 recovered above the upper control limit (± 50% recovery or drift) for benzoic acid (+69.8%). The aforementioned analyte was non-detect in associated samples, so data qualification due to the high-biased recovery was not applicable.

The SVOC closing CCV associated with analytical batch 206278 recovered below the lower control limit (± 50% recovery or drift) for 4,6-dinitro-2-methylphenol (-54.7%) and 2,4-dinitrophenol (-75.9%). Consequently, the 4,6-dinitro-2-methylphenol and 2,4-dinitrophenol results in associated sample 15FWOU424WG were qualified (J-) as potential low estimates. Impact to data quality is negligible as neither analyte is a site contaminant of concern and the affected results are non-detect with a LOD one order of magnitude less than the cleanup level or a cleanup level is not established.

The minimum response factor (RF) for n-nitrosodi-n-propylamine was below the control limit in the CCV sample associated with SVOC analytical batch 206553. Consequently, the n-nitrosodi-n-propylamine result in samples 15FWOU425WG and 15FWOU426WG were qualified (J-) as potential low estimates. The affected results for n-nitrosodi-n-propylamine are non-detect and the LODs are greater than the cleanup level. However, n-nitrosodi-n-propylamine is not a site contaminant of concern and the inadequate sensitivity for its analysis was identified in the work plan.

c. Were all corrective actions documented?

☐✓Yes No ☐NA (Please explain.) Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Case narrative does not discuss effect on data quality, it only discusses discrepancies and what was done in light of them. Any notable data quality issues mentioned in the case narrative are discussed above in 4b or elsewhere within this ADEC checklist.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☐✓Yes No ☐NA (Please explain.) Comments:

b. All applicable holding times met?

☐Yes ✓No ☐NA (Please explain.) Comments:

VOC sample 15FWOU426WG was analyzed 1 day outside of holding time. Consequently, all VOC results for sample 15FWOU426WG were qualified (J-) as potential low estimates. Impact to data is negligible as sample 15FWOU426WG is a field duplicate of sample 15FWOU425WG (which was analyzed within holding time) and all VOC analytes met the field duplicate comparison criteria of 30% RPD. See section 6eiii for field duplicate data comparisons.

VOC sample 15FWOU425WG was analyzed in batch 206259 within the method-specified holding time; however, the analysis of a MS/MSD on that sample was not performed within holding time. The laboratory re-analyzed the sample and performed a MS/MSD in subsequent batch 206347, but the analysis was performed 1 day outside of holding time. The two sets of results from the parent samples are comparable and the results for the analysis performed within holding time are reported.

c. All soils reported on a dry weight basis?

☐Yes No ☐✓NA (Please explain.) Comments:

No soil samples were included in this report.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☐Yes ✓No ☐NA (Please explain.) Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable cleanup level for non-detect results. Two VOC analytes (1,2,3-trichloropropane and 1,2-dibromoethane (EDB)), one SVOC analyte (n-nitrosodi-n-propylamine) and one metal (thallium) analyzed by methods SW8260C, SW8270D, and SW6020A, respectively, did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345 in all project samples. Therefore, the aforementioned analytes may not be detected, if present, at the respective cleanup level. The affected VOC and SVOC analytes are not site contaminants of concern and the inadequate analytical sensitivity for these analytes were identified in the work plan, so impact to the project is negligible. Although the analysis of thallium is a requirement of the landfill permit, impact to the project is likely negligible as thallium has been non-detected or detected only at trace concentrations at this site since 1997.

In addition, SVOC sample 15FWOU424WG required dilution (5x), which effectively elevated LODs. Consequently, SVOC analytes bis-(2-chloroethyl)ether, dibenzo(a,h) anthracene, hexachlorobenzene, and pentachlorophenol have LODs slightly above respective ADEC cleanup levels. Impact to data quality is likely negligible as none of these analytes are contaminants of concern and are typically non-detect at this site.

Non-detect analytes with LODs reported above cleanup levels are identified with gray highlight in the analytical results table (Table C-2)

e. Data quality or usability affected?

Comments:

See discussion above in 5d.

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☐✓Yes No ☐NA (Please explain.) Comments:

ii. All method blank results less than PQL?

☐ ✓Yes No ☐NA (Please explain.) Comments:

No method blank results were above the LOQ; however, a few analytes did have detections below the LOQ.

SVOC analytes benzyl butyl phthalate, di-n-butyl phthalate, and diethyl phthalate were detected in the method blank sample contained in extraction batch 205525 at concentrations below the LOQ (report 580-55009). Neither benzyl butyl phthalate nor di-n-butyl phthalate were detected in associated project samples, so these data were not qualified. Diethyl phthalate was detected in sample 15FWOU424WG at a concentration less than five-times that of the method blank and the result was qualified (B) as potential laboratory cross-contamination. Impact to the result is negligible as the affected result is approximately four orders of magnitude less than the ADEC cleanup level.

VOC analytes carbon disulfide, methylene chloride and m&p-xylenes were detected in the method blank sample contained in extraction batch 206347 at concentrations below the LOQ (report 580-55009). Carbon disulfide, methylene chloride and m&p-xylenes were detected in associated sample 15FWOU426WG at concentrations less than five-times (ten-times for methylene chloride) that of the method blank and were qualified (B) as potential laboratory cross-contamination. Impact to results is negligible as the affected results are less than the ADEC cleanup level.

iii. If above PQL, what samples are affected?

Comments:

See discussion above in 6aii.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

v. Data quality or usability affected? (Please explain.)

Comments:

See discussion above in 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☐Yes ✓No ☐NA (Please explain.) Comments:

No project MS/MSD was reported in VOC batches 206157 and 206259. Potential matrix interference in the aforementioned VOC batches could not be evaluated; however, batch accuracy and precision were assessed from the LCS and LCSD. The batches contained the following 3 project samples: 15FWOU424WG, 15FWOU425WG, and trip blank sample 15FWOU427WQ.

A project-specific MS/MSD sample was performed in SVOC extraction batch 205525; however, the parent sample is associated with a different SDG and the results were discussed in preceding report 580-54924. Additionally, a MS/MSD sample was analyzed in SVOC extraction batch 205802, but the spike compounds were inadvertently omitted during the extraction process. Batch accuracy and precision was evaluated from the LCS and LCSD. The batch contained samples 15FWOU425WG and 15FWOU426WG.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐Yes ✓No ☐NA (Please explain.) Comments:

No OU4 project MS/MSD was reported in sulfate batch 206699. The laboratory analyzed a MS/MSD in the batch but on another client's sample. Although potential matrix interference could not be evaluated in this batch; batch accuracy and precision were assessed from the LCS and LCSD. The batch contained sample 15FWOU426WG.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

See discussion in 6bv below.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

See discussion in 6bv below.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The VOC LCS and LCSD sample contained in extraction batch 206157 recovered above the upper control limit for dichlorodifluoromethane (168%/193% vs. 152%) and the following analytes had RPD values greater than the control limit (20%), but had acceptable LCS and LCSD recoveries: acetone (36%), 2-butanone (40%), 4-methyl-2-pentanone (35%), 2-hexanone (29%), 1,1,2,2-tetrachloroethane (22%), and 1,2-dibromo-3-chloropropane (33%) report 580-55009). All aforementioned analytes were non-detect in associated samples so no data qualifications were applied.

The VOC LCS and LCSD sample contained in extraction batch 206347 recovered above the upper control limit for dichlorodifluoromethane (186%/202% vs. 152%) and methylene chloride (126%/136% vs. 124%) (report 580-55009). The results of the aforementioned analytes in associated sample 15FWOU426WG were qualified (J+) as potential high estimates. Impact to the data is negligible as the results are potentially high-biased and are less than respective ADEC cleanup levels.

The SVOC LCS and/or LCSD sample contained in extraction batch 205525 recovered outside control limits for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-55009). Low recoveries include 4-nitroaniline (62%/59% vs. 70%), 4,6-dinitro-2-methylphenol (24%/35% vs. 44%), anthracene (46%/44% vs. 57%), 3,3’-dichlorobenzidine (3%/2% vs. 27%), 2,4-dimethylphenol (24% vs. 31%), 4-chloroaniline (2%/1% vs. 33%), hexachlorocyclopentadiene (14%/14% vs. 20%), and 3-nitroaniline (38%/10% vs. 41%). All results for 3,3’-dichlorobenzidine and 4-chloroaniline in associated sample 15FWOU424WG were rejected (qualified “R”) due to recoveries below 10%. Neither analyte is a site contaminant of concern so impact to the project is negligible. The remaining aforementioned analytes (4-nitroaniline, 4,6-dinitro-2-methylphenol, anthracene, 2,4-dimethylphenol, hexachlorocyclopentadiene, and 3-nitroaniline) were qualified (J-) in associated sample 15FWOU424WG as potential low estimates; however, impact to the project is negligible as the results are either non-detect with LODs two to five orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. High recoveries include butyl benzyl phthalate (150% vs. 134%) and bis(2-ethylhexyl)phthalate (204% vs. 135%). Bis(2-ethylhexyl)phthalate also had a RPD value (58%) greater than the control limit (20%). Consequently, the bis(2-ethylhexyl)phthalate result for associated sample 15FWOU424WG was qualified (J+) as a potential high estimate. The affected bis(2-ethylhexyl)phthalate result may have been adversely impacted by the high-biased LCS recovery as the recovery was two times the spiked amount and the result in the sample is three times the cleanup level. However, bis(2-ethylhexyl)phthalate also exceeded in this well (AP-6532) during the spring 2015 sampling event (and prior to that exceeded in 2009). Butyl benzyl phthalate was not detected in the associated project sample, so no data were qualified. Additionally, 2,4-dinitrophenol (35%) and 2-nitrophenol (27%) had RPD values greater than the control limit (20%), but had acceptable LCS and LCSD recoveries. Neither analyte was detected in the associated sample so no data qualifications were applied.

The SVOC LCS and/or LCSD sample contained in extraction batch 205802 recovered below the lower control limit for several analytes, and the RPD for select analytes also exceeded the criterion due to these recovery failures (report 580-55009). Low recoveries include benzyl alcohol (5% vs. 31%), 2-nitrophenol (26%/35% vs. 47%), 2,4-dimethylphenol (25% vs. 31%), 4-chloroaniline (2%/2% vs. 33%), hexachlorocyclopentadiene (7%/9% vs. 20%), acenaphthylene (29%/31% vs. 41%), 3-nitroaniline (5%/6% vs. 41%), 2,4-dinitrophenol (11%/12% vs. 23%), 2,4-dinitrotoluene (41% vs. 57%), 4-nitroaniline (47%/45% vs. 70%), 4,6-dinitro-2-methylphenol (6%/13% vs. 44%), n-nitrosodiphenylamine (42%/36% vs. 51%), anthracene (22%/19% vs. 57%), 3,3'-dichlorobenzidine (2%/2% vs. 27%), and benzo(a)pyrene (19%/15% vs. 54%). All results for 4-chloroaniline, hexachlorocyclopentadiene, 3-nitroaniline, and 3,3'-dichlorobenzidine in associated samples 15FWOU425WG and 15FWOU426WG were rejected (qualified "R") due to recoveries of both the LCS and LCSD samples being below 10%. The remaining aforementioned analytes (benzyl alcohol, 2-nitrophenol, 2,4-dimethylphenol, acenaphthylene, 2,4-dinitrophenol, 2,4-dinitrotoluene, 4-nitroaniline, 4,6-dinitro-2-methylphenol, n-nitrosodiphenylamine, anthracene, and benzo(a)pyrene) were qualified (J-) as potential low estimates in associated samples 15FWOU425WG and 15FWOU426WG; however, impact to the project is negligible as the analytes are not site contaminants of concern, and the affected results are either detected at trace concentrations (or are non-detect) with LODs one to six orders of magnitude less than ADEC cleanup levels or cleanup levels are not established. Additionally, 2-methylphenol (22%) and benzoic acid (26%) had RPD values greater than the control limit (20%), but had acceptable LCS and LCSD recoveries. Consequently, the detected benzoic acid result in associated sample 15FWOU426WG was qualified (J) as a potential estimate due to batch imprecision. Impact to the affected benzoic acid datum is negligible as the failure was not significant and the affected result is five orders of magnitude less than the ADEC cleanup level. 2-Methylphenol was not detected in associated samples so no data qualifications were applied.

The VOC MS and/or MSD prepared from sample 15FWOU425WG recovered above the upper control limit for dichlorodifluoromethane (225%/183% vs. 152%) and vinyl chloride (155% vs. 137%), and the RPD for vinyl chloride also exceeded the criterion due to the recovery failure (report 580-55009). Consequently, the detected results of dichlorodifluoromethane in the parent sample and associated field duplicate sample (15FWOU426WG) were qualified (J+) as potential high estimates. Impact to data quality is negligible as the affected results are four orders of magnitude less than the ADEC cleanup level. Vinyl chloride was not detected in the parent sample, so no data were qualified. Moreover, 4-methyl-2-pentanone (55%) recovered below the lower control limit (67%), which resulted in data qualification ("J-" flags) of the field duplicate pair. Impact to 4-methyl-2-pentanone data quality is negligible as the failure was not significant and the affected results were non-detect with LODs four orders of magnitude less than the cleanup level. Additionally, chloromethane (21%), acetone (26%), 2,2-dichloropropane (25%), 2-butanone (41%), 4-methyl-2-pentanone (48%), 2-hexanone (31%), 1,1,1,2-tetrachloroethane (23%), 1,1,2,2-tetrachloroethane (30%), 1,2,3-trichloropropane (23%), 1,2-dibromo-3-chloropropane (43%), 1,2,4-trichlorobenzene (29%), 1,2,3-trichlorobenzene (40%), and naphthalene (48%) had RPD values greater than the control limit (20%), but had acceptable MS and MSD recoveries. Of the aforementioned analytes, only naphthalene was detected (not in the parent sample but in the associated field duplicate). Consequently, the naphthalene result in field duplicate sample 15FWOU426WG was qualified (J) as a potential estimate. Impact to naphthalene data quality is negligible as the detection was three orders of magnitude less than the ADEC cleanup level.

The methane MS and MSD prepared from sample 15FWOU425WG recovered outside the control limits (report 580-55009). However, the sample result was greater than the spike concentration so recovery criteria were not applicable. No data qualifications were applied.

The sulfate MS and MSD prepared from sample 15FWOU425WG recovered above the upper control limit (111%/112% vs. 110%) (report 580-55009). Consequently, the sulfate result in parent sample and associated field duplicate sample (15FWOU426WG) were qualified (J+) as potentially high-biased estimates. Impact to data is negligible as the recovery exceedances were marginally above control limits and the sulfate results from this well (AP-6535) are consistent with historical concentrations.

The metals MSD prepared from sample 15FWOU425WG recovered above the upper control limit for cadmium (118% vs. 115%), lead (116% vs. 115%), and thallium (118% vs. 116%) (report 580-55009). Consequently, detected results for cadmium and lead were qualified (J+) as potential high estimates in the parent sample and associated field duplicate sample (15FWOU426WG), as indicated below. Impact to the data quality is negligible as the recovery exceedances were marginal and the affected data are less than the respective ADEC cleanup level. Thallium was not detected in either sample, so no data were qualified due to the high recovery.

- cadmium: 15FWOU425WG
- lead: 15FWOU425WG and 15FWOU426WG

Cadmium exceeded the 20% RPD limit for the laboratory duplicate of sample 15FWOU425WG (51%) (report 580-55009). The cadmium results were less than the LOQ and are considered estimated values (J flagged), so no additional flagging was applied. Impact to data was minor as the higher of the two results was reported and it is an order of magnitude below the cleanup level.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

See discussion above in 6biii.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☐✓Yes No ☐NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☐Yes ✓No ☐NA (Please explain.) Comments:

SVOC surrogate terphyenyl-d14 recovered above the upper control limits (134%) in sample 15FWOU424WG (140%) (report 580-55009). Consequently, all detected SVOC analytes in the sample were qualified (J+) as potential high estimates. Impact to the data is likely negligible as the surrogate recovery failure was marginal, and 5 of 6 surrogates had acceptable recoveries.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐✓Yes No ☐NA (Please explain.) Comments:

iv. Data quality or usability affected? (Use the comment box to explain.)

Comments:

See discussion above in 6cii.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☐✓Yes No ☐NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☐✓Yes No ☐NA (Please explain.) Comments:

Trip blank sample 15FWOU427WQ was included in cooler 111001.

iii. All results less than PQL?

☐✓Yes No ☐NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, methylene chloride and naphthalene were detected in trip blank sample 15FWOU427WQ at concentrations below the LOQ. Both methylene chloride and naphthalene were detected in associated sample 15FWOU426WG. However, the methylene chloride detected in sample 15FWOU426WG was also detected in the associated method blank sample, thus the result was qualified in method blank section 6aii. No further methylene chloride qualifications were applied due to the trip blank detection. Naphthalene was detected in sample 15FWOU426WG at a concentration within five-times that of the trip blank sample and was consequently qualified (B) as potential cross-contamination. Impact to the project was negligible as the affected datum is approximately three orders of magnitude less than the ADEC cleanup level.

iv. If above PQL, what samples are affected?

Comments:

See discussion above in 6diii.

v. Data quality or usability affected? (Please explain.)

Comments:

See discussion above in 6diii.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☐✓Yes   No   ☐NA (Please explain.)   Comments:

One field duplicate sample was collected for the two primary groundwater samples associated with this work order.

ii. Submitted blind to lab?

☐✓Yes   No   ☐NA (Please explain.)   Comments:

Sample 15FWOU426WG was a field duplicate of 15FWOU425WG (AP-6535).

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $$\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐Yes ✓No ☐NA (Please explain.)   Comments:

All results for the field duplicate sample pair 15FWOU425WG/15FWOU426WG were comparable (RPD ≤ 30%), with the exception of methylene chloride, naphthalene, toluene, m&p-xylenes, nitrobenzene, and bis(2-chloroisopropyl)ether. The results for methylene chloride, naphthalene, toluene, and m&p-xylenes in both samples were less than the LOQ and are considered estimated values (J flagged), so no additional flagging was applied. The nitrobenzene and bis(2-chloroisopropyl)ether results of the field duplicate pair (identified in gray highlight) were qualified (J) as potential estimates due to imprecision. Neither analyte was detected in the primary sample but both were detected in the field duplicate sample at concentrations slightly above the LOQ. Impact to the project is negligible as neither analyte is a site contaminant of concern and the results were one order of magnitude below the ADEC cleanup level or a cleanup level has not been established.

All detected results for the primary and field duplicate samples are shown in the table below. Non-detect results are also presented for contaminants of concern (only). In the case where a result was detected in one sample but non-detect in the other, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable. Units are mg/L for sulfate and μg/L for remaining analytes.

Analyte	Method	Units	15FWOU425WG (primary)	Qualifier	15FWOU426WG (Field Duplicate)	Qualifier	RPD	Comparison Criteria Met?
Sulfate	E300.0	mg/L	18	J	18		0	Yes
Methane	RSK175	μg/L	1600	J	1300		21	Yes
Iron	SW6010C	μg/L	29000		30000		3	Yes
Antimony	SW6020A	μg/L	ND(1)		ND(1)		0	Yes

Arsenic	SW6020A	µg/L	2.4	J	2.2	J	9	Yes
Barium	SW6020A	µg/L	270		270		0	Yes
Beryllium	SW6020A	µg/L	ND(1.3)		ND(1.3)		0	Yes
Cadmium	SW6020A	µg/L	0.27	J	ND(0.3)		11	Yes
Chromium	SW6020A	µg/L	1.6	J	1.3	J	21	Yes
Cobalt	SW6020A	µg/L	ND(0.6)		ND(0.6)		0	Yes
Copper	SW6020A	µg/L	ND(7.5)		ND(7.5)		0	Yes
Lead	SW6020A	µg/L	0.52	J	0.39	J	29	Yes
Nickel	SW6020A	µg/L	ND(5)		ND(5		0	Yes
Selenium	SW6020A	µg/L	ND(4)		ND(4		0	Yes
Silver	SW6020A	µg/L	ND(0.35)		ND(0.35)		0	Yes
Thallium	SW6020A	µg/L	ND(2.5)		ND(2.5)		0	Yes
Vanadium	SW6020A	µg/L	ND(10)		ND(10)		0	Yes
Zinc	SW6020A	µg/L	ND(20)		ND(20)		0	Yes
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	ND(0.50)		ND(0.50)		0	Yes
1,1,2-Trichloroethane	SW8260C	µg/L	ND(0.50)		ND(0.50)		0	Yes
1,2-Dichloroethane	SW8260C	µg/L	0.39	J	0.42	J	7	Yes
Benzene	SW8260C	µg/L	3.4	J	3.4		0	Yes
Carbon disulfide	SW8260C	µg/L	ND(0.50)		0.47	J	6	Yes
Dichlorodifluoromethane	SW8260C	µg/L	0.78	J	0.69	J	12	Yes
Methylene chloride	SW8260C	µg/L	ND(2.0)		1.3	J	42	Not Applicable
Naphthalene	SW8260C	µg/L	ND(1.0)		0.38	J	90	Not Applicable
Toluene	SW8260C	µg/L	ND(1.0)		0.54	J	60	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	0.60	J	0.59	J	2	Yes
Vinyl chloride	SW8260C	µg/L	ND(0.50)		ND(0.50)		0	Yes
Xylene, Isomers m & p	SW8260C	µg/L	0.21	J	0.32	J	42	Not Applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	33	J	33		0	Yes
trans-1,2-Dichloroethene	SW8260C	µg/L	3.3	J	3.0		10	Yes
Benzoic acid	SW8270D	µg/L	ND(0.99)		1.0	J	1	Yes
Nitrobenzene	SW8270D	µg/L	ND(0.20)		1.7		158	No
Phenol	SW8270D	µg/L	0.25	J	0.32	J	25	Not Applicable
bis(2-Chloroisopropyl)ether	SW8270D	µg/L	ND(0.20)		0.57		96	No
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/L	ND(2.0)		ND(2.1)		5	Yes

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

See discussion above in 6eiii.

f. Decontamination or Equipment Blank (If not used explain why).

No equipment blank was required because the wells were sampled with a peristaltic pump employing dedicated Teflon-lined tubing at each well.

☐Yes No ☐✓NA (Please explain.) Comments:

i. All results less than PQL?

☐Yes ☐ No ☐✓NA (Please explain.) Comments:

No equipment blank was required.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

iii. Data quality or usability affected? (Please explain.)

Comments:

Not applicable.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?

✓Yes No ☐NA (Please explain.) Comments:

Sample results reported below the LOQ are flagged (J) as estimated values.

No other data flags/qualifiers were used.

ERA
A Waters Company

Applicable to project
OU4

LAB: TA-Seattle

OU4 Sample: 15FWOU416WG (VOC, SVOC, Metals)
SDG 580-48876

April 23, 2015

Vanessa Ritchie
Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Dear Vanessa:

Enclosed please find the certification documentation for the whole volume double blind performance evaluation samples. The samples were shipped on April 8, 2015 via FedEx Priority over-night service to your attention. The ERA project number corresponding to these samples is 0319-15-03.

Thank you for choosing ERA for this project. If you have any questions or if we can be of any further assistance please do not hesitate to call.

Sincerely,

Chad Lane
Chemist

enclosures
cl

16341 Table Mountain Pkwy ▪ Golden, CO 80403 ▪ 800.372.0122 ▪ 303.431.8454 ▪ fax 303.421.0159 ▪ www.eraqc.com

ERA
A Waters Company

COPY

ERA, A Waters Company
Sample Identification and Chain of Custody Form

Ship to: Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Phone: 907-452-2450
Fax:
Attention: Vanessa Ritchie

Ship from: ERA, A Waters Company
16341 Table Mountain Parkway
Golden, CO 80403

Phone: 800-372-0122 or 303-431-8454
Fax: 303-421-0159
Contact: Chad Lane

Sample Description	Sample Identification	Sample Date	Sample Type	# of Containers	Preservative
VOCs by 8260B	0319-15-03.1	04/08/15	Aqueous	3 x 40 mL	HCl
SVOC's	0319-15-03.2	04/08/15	Aqueous	2 x 1L	None
Metals	0319-15-03.3	04/08/15	Aqueous	2 x 250 mL	HNO3

		Condition of Contents
Relinquished by:	Date/Time: 8-Apr-2015 1600	
Received by:	Date/Time:	
Relinquished by:	Date/Time:	
Received by:	Date/Time:	
Relinquished by:	Date/Time:	
Received by:	Date/Time:	

ERA
A Waters Company

Reference Materials

▪ Certificate of Analysis ▪

Product: WatR™ Supply Regulated Volatiles
Catalog Number: 703/093
Lot No. 0319-15-03.1
Certificate Issue Date: April 23, 2015
Expiration Date: NA
Revision Number: Original

CERTIFICATION

Parameter	Certified Value[1] µg/L	Uncertainty[2] %	QC Performance Acceptance Limits[3] µg/L	PT Performance Acceptance Limits[4] µg/L
Benzene	17.0	0.636	13.7 - 20.2	13.6 - 20.4
Carbon tetrachloride	6.37	0.652	4.56 - 7.96	3.82 - 8.92
Chlorobenzene	3.75	1.53	3.03 - 4.50	2.25 - 5.25
1,2-Dichlorobenzene	7.49	2.14	5.87 - 9.06	4.49 - 10.5
1,4-Dichlorobenzene	13.7	0.638	10.2 - 16.6	11.0 - 16.4
1,2-Dichloroethane	12.4	1.29	9.91 - 15.3	9.92 - 14.9
1,1-Dichloroethylene	8.90	1.02	6.50 - 11.7	5.34 - 12.5
cis-1,2-Dichloroethylene	12.0	1.02	9.24 - 14.8	9.60 - 14.4
trans-1,2-Dichloroethylene	11.2	1.02	8.61 - 13.9	8.96 - 13.4
1,2-Dichloropropane	3.09	0.952	2.48 - 3.71	1.85 - 4.33
Ethylbenzene	11.6	3.11	9.12 - 14.2	9.28 - 13.9
Methylene chloride (Dichloromethane)	10.1	1.02	7.34 - 12.6	8.08 - 12.1
Styrene	4.23	0.778	3.27 - 5.29	2.54 - 5.92
1,1,2,2-Tetrachloroethane*	13.0	1.61	10.0 - 16.6	NA
Tetrachloroethylene	8.49	0.652	6.04 - 10.1	5.09 - 11.9
Toluene	8.00	0.652	6.34 - 9.44	4.80 - 11.2
1,2,4-Trichlorobenzene	17.7	0.784	11.7 - 21.9	14.2 - 21.2
1,1,1-Trichloroethane	6.34	0.652	4.76 - 7.73	3.80 - 8.88
1,1,2-Trichloroethane	2.78	4.60	2.20 - 3.36	1.67 - 3.89
Trichloroethylene	11.6	1.02	8.89 - 13.7	9.28 - 13.9
Vinyl chloride	7.00	2.12	4.47 - 10.2	4.20 - 9.80
m-Xylene	6.99	0.652	5.49 - 8.53	-
m&p-Xylene	15.1	3.56	11.9 - 18.4	-
o-Xylene	11.7	1.02	9.20 - 14.3	-
p-Xylene	8.13	1.02	6.39 - 9.92	-
Xylenes, total	26.8	0.924	21.1 - 32.7	21.4 - 32.2

ANALYTICAL VERIFICATION

Parameter	Certified Value[1]	Proficiency Testing Study		n	NIST Traceability	
		Mean	Recovery[5]		SRM Number	Recovery
	µg/L	µg/L	%			%
Benzene	17.0	17.5	103	4	1586-1	99.7
Carbon tetrachloride	6.37	6.39	100	3	1639	93.4
Chlorobenzene	3.75	4.08	109	3	1586-1	110
1,2-Dichlorobenzene	7.49	8.12	108	3	-	-
1,4-Dichlorobenzene	13.7	14.6	106	3	-	-
1,2-Dichloroethane	12.4	12.0	96.9	4	3012	100
1,1-Dichloroethylene	8.90	10.4	116	2	-	-
cis-1,2-Dichloroethylene	12.0	12.1	101	3	-	-
trans-1,2-Dichloroethylene	11.2	12.2	109	2	-	-
1,2-Dichloropropane	3.09	3.27	106	3	3009	102
Ethylbenzene	11.6	11.3	97.7	4	3002	98.7
Methylene chloride (Dichloromethane)	10.1	10.7	106	4	3008	105
Styrene	4.23	4.94	117	3	-	-
Tetrachloroethylene	8.49	9.22	109	5	1639	105
Toluene	8.00	8.61	108	4	3001	103
1,2,4-Trichlorobenzene	17.7	18.1	102	4	-	-
1,1,1-Trichloroethane	6.34	6.50	102	3	3011	98.5
1,1,2-Trichloroethane	2.78	3.04	109	3	-	-
Trichloroethylene	11.6	11.3	97.5	4	1639	93.9
Vinyl chloride	7.00	9.62	137	3	-	-
m-Xylene	6.99	-	-	-	3004	97.1
m&p-Xylene	15.1	-	-	-	-	-
o-Xylene	11.7	-	-	-	3003	99.2
p-Xylene	8.13	-	-	-	3005	103
Xylenes, total	26.8	28.2	105	4	-	-

1. The **Certified Values** are the actual "made-to" concentrations confirmed by ERA analytical verification. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

2. The stated **Uncertainty** is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation and internal analytical verification of the product by ERA, multiplied by a coverage factor. The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product.

3. The **QC Performance Acceptance Limits (QC PALs™)** are based on actual historical data collected in ERA's Proficiency Testing program. The QC PALs™ reflect any inherent biases in the methods used to establish the limits and closely approximate a 95% confidence interval of the performance that experienced laboratories should achieve using accepted environmental methods. Use the QC PALs™ to realistically evaluate your performance against your peers.

4. The **PT Performance Acceptance Limits (PT PALs™)** are calculated using the regression equations and fixed acceptance criteria specified in the NELAC proficiency testing requirements. Use the PT PALs™ when analyzing this QC standard alongside USEPA and NELAC compliant PT standards. Please note that many PT study acceptance limits are concentration dependent (some non-linearly) and, therefore, the acceptance limits of this QC standard and any PT standard may differ relative to their difference in concentrations.

5. The **PT Data/Traceability** data include the mean value, percent recovery and number of data points reported by the laboratories in our Proficiency Testing study compared to the Certified Values. In addition, where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. This product is traceable to the lot numbers of its starting materials. All gravimetric and volumetric measurements related to its manufacture are traceable to NIST through an unbroken chain of comparisons.
Traceability Recovery (%) = [(% recovery certified standard)/(% recovery NIST SRM)]*100
The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs.

6. m, o & p-xylenes analyzed as total xylenes in the study.

7. For additional information on this product such as intended use, instructions for use, level of homogeneity, and safety information, please refer to the provided Instruction Sheet

* This analyte was added as a supplemental spike

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer	**Quality Officer**
Mike Blades	**Kristina Sanchez**

ERA

A Waters Company

Reference Material

▪ Certificate of Analysis ▪

Product: Custom SVOC's
Catalog Number: 093
Lot No: 0319-15-03.2
Certificate Issue Date: April 23, 2015
Expiration Date: NA
Revision Number: Original

CERTIFICATION

Parameter	Certified Value[1]	Uncertainty[2]	QC Performance Acceptance Limits[3]			NIST Traceability[4]	
	µg/L	%	µg/L			SRM#	Recovery %
bis(2-Ethylhexyl)phthalate	15.6	0.848	8.10	-	18.9	NA	NA

Matrix: 18 megohm deionized water
Density: NA
Storage: 4 ±2 °C
Manufacturing Notes: The sample is ready for preparation and analysis as received.

1. The Certified Values are equal to 100% of the "made to" values as determined by volumetric and/or gravimetric measurements made during the manufacture of this product.

2. The stated Uncertainty is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation and (as noted) internal analytical verification of the product by ERA, multiplied by a coverage factor. The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product.

3. The Performance Acceptance Limits (PALs™) are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval. The PALs™ are based on analytical verification data generated by ERA, independent referee laboratory results and/or data from USEPA methods, WP, WS and CLP interlaboratory studies. Recovery and advisory range data for these studies are based on ERA's normal manufacturing ranges. If your result falls outside of the PALs™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

4. Where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. Traceability Recovery % = [(% recovery certified standard)/(% recovery NIST SRM)]*100. The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer:
Brian Miller

Brian Miller

ISO/IEC 17025:2005
ACCREDITED
CHEMICAL TESTING LABORATORY
CERTIFICATE NO. 1539.02

Quality Officer:
Kristina Sanchez

ERA
A Waters Company

Reference Materials

▪ Certificate of Analysis ▪

Product:	WatR™ Pollution Trace Metals
Catalog Number:	500
Lot No.	P235-500
Certificate Issue Date:	October 28, 2014
Expiration Date:	December 31, 2016
Revision Number:	Original

Fairbanks Environmental Services
ERA Sample ID # 0319-15-03.3

CERTIFICATION

Parameter	Certified Value[1] µg/L	Uncertainty[2] %	QC Performance Acceptance Limits[3] µg/L	PT Performance Acceptance Limits[4] µg/L
Aluminum	2140	0.460	1870 - 2440	1780 - 2450
Antimony	271	0.580	236 - 301	210 - 323
Arsenic	136	0.674	118 - 151	103 - 169
Barium	777	1.83	706 - 847	660 - 894
Beryllium	214	0.454	193 - 233	182 - 246
Boron	950	0.458	852 - 1080	808 - 1090
Cadmium	424	0.526	376 - 449	360 - 488
Chromium	331	1.38	301 - 361	281 - 381
Cobalt	516	2.76	480 - 573	439 - 593
Copper	242	1.68	219 - 264	206 - 278
Iron	1660	2.78	1500 - 1840	1410 - 1910
Lead	812	0.466	732 - 893	690 - 934
Manganese	911	0.466	842 - 993	774 - 1050
Molybdenum	241	0.462	216 - 263	205 - 274
Nickel	521	0.474	474 - 568	454 - 592
Selenium	776	1.09	679 - 861	660 - 892
Silver	796	0.464	714 - 876	677 - 915
Strontium	499	0.526	452 - 549	424 - 574
Thallium	606	0.470	531 - 673	501 - 701
Vanadium	1070	0.460	974 - 1140	910 - 1230
Zinc	885	0.472	802 - 974	752 - 1020

ANALYTICAL VERIFICATION

ISO/IEC GUIDE 34:2009 ACCREDITED
ISO/IEC 17025:2005 ACCREDITED

Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number	Recovery
	µg/L	µg/L	%			%
Aluminum	2140	2100	98.4	52	3101a	103
Antimony	271	264	97.6	55	3102a	97.4
Arsenic	136	133	97.7	62	3103a	102
Barium	777	768	98.8	52	3104a	101
Beryllium	214	210	98.1	54	3105a	103
Boron	950	955	101	36	3107	103
Cadmium	424	420	99.1	66	3108	101
Chromium	331	331	99.9	63	3112a	103
Cobalt	516	534	103	49	3113	104
Copper	242	243	100	71	3114	101
Iron	1660	1680	101	61	3126a	104
Lead	812	804	99.0	71	3128	98.9
Manganese	911	922	101	56	3132	104
Molybdenum	241	236	98.0	52	3134	99.6
Nickel	521	515	98.8	64	3136	99.7
Selenium	776	772	99.5	58	3149	103
Silver	796	794	99.7	54	3151	102
Strontium	499	490	98.2	31	3153a	100
Thallium	606	590	97.4	50	3158	100
Vanadium	1070	1060	98.7	49	3165	103
Zinc	885	878	99.2	67	3168a	104

1. The **Certified Values** are the actual "made-to" concentrations confirmed by ERA analytical verification. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

2. The stated **Uncertainty** is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation and internal analytical verification of the product by ERA, multiplied by a coverage factor. The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product.

3. The **QC Performance Acceptance Limits (QC PALs™)** are based on actual historical data collected in ERA's Proficiency Testing program. The QC PALs™ reflect any inherent biases in the methods used to establish the limits and closely approximate a 95% confidence interval of the performance that experienced laboratories should achieve using accepted environmental methods. Use the QC PALs™ to realistically evaluate your performance against your peers.

4. The **PT Performance Acceptance Limits (PT PALs™)** are calculated using the regression equations and fixed acceptance criteria specified in the NELAC proficiency testing requirements. Use the PT PALs™ when analyzing this QC standard alongside USEPA and NELAC compliant PT standards. Please note that many PT study acceptance limits are concentration dependent (some non-linearly) and, therefore, the acceptance limits of this QC standard and any PT standard may differ relative to their difference in concentrations.

5. The **PT Data/Traceability** data include the mean value, percent recovery and number of data points reported by the laboratories in our Proficiency Testing study compared to the Certified Values. In addition, where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. This product is traceable to the lot numbers of its starting materials. All gravimetric and volumetric measurements related to its manufacture are traceable to NIST through an unbroken chain of comparisons.
Traceability Recovery (%) = [(% recovery certified standard)/(% recovery NIST SRM)]*100
The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs.

6. For additional information on this product such as intended use, instructions for use, level of homogeneity, and safety information, please refer to the provided Instruction Sheet

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer	**Quality Officer**
Tom Widera	**Kristina Sanchez**
Thomas Widera	

APPENDIX C

SAMPLE TRACKING AND ANALYTICAL RESULTS TABLES

Table C-1 Groundwater Sample Tracking
Operable Unit 4
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Type	Sampler Initials	Sample Date	Sample Time	VOC (8260B)	SVOC (8270D)	Methane (RSK-175)	Total Metals (6020A)	Iron (6010C)	Sulfate (300.0)	SDG	Cooler ID
Groundwater Samples - Landfill Source Area													
15FWOU401WG	FWLF-4	primary	CB	4/7/2015	855	X	X	X	X	X	X	580-48876	040901, 02, 03
15FWOU402WG	AP-6532	primary	JK	4/7/2015	1045	X	X	X	X	X	X	580-48876	040901, 02, 03
15FWOU403WG	AP-6138	primary	CB	4/7/2015	1055	X	X	X	X	X	X	580-48876	040901, 02, 03
15FWOU404WG	AP-6535	primary	JK	4/7/2015	1300	X	X	X	X	X	X	580-48876	040901, 02, 03
15FWOU405WG	AP-8061	primary	CB	4/7/2015	1210	X	X	X	X	X	X	580-48876	040901, 02, 03
15FWOU406WG	AP-6530	primary	JK	4/7/2015	1510	X	X	X	X	X	X	580-48876	040901, 02, 04
15FWOU407WG	AP-5588	primary	CB	4/7/2015	1520	X	X	X	X	X	X	580-48876	040901, 02, 04
15FWOU409WG	AP-5589	primary	CB	4/7/2015	1645	X	X	X	X	X	X	580-48876	040901, 02, 04
15FWOU410WG	AP-6136	primary	JK	4/8/2015	1350	X	X	X	X	X	X	580-48876	040901, 02, 04
15FWOU411WG	AP-8063	primary/MS/MSD	JK	4/8/2015	1015	X	X	X	X	X	X	580-48876	040901, 02, 05
15FWOU412WG	AP-6060	field duplicate of 15FWOU411WG	JK	4/8/2015	1030	X	X	X	X	X	X	580-48876	040901, 02, 05
15FWOU418WG	AP-8061	primary	JK	11/6/2015	1030	X	X	X	X	X	X	580-54924	110901, 02
15FWOU422WG	AP-6530	primary	JK	11/6/2015	1630	X	X	X	X	X	X	580-54924	110901, 02
15FWOU424WG	AP-6532	primary	JK	11/9/2015	1350	X	X	X	X	X	X	580-55009	111001, 02
15FWOU425WG	AP-6535	primary/MS/MSD	JK	11/9/2015	1510	X	X	X	X	X	X	580-55009	111001, 02
15FWOU426WG	AP-4040	field duplicate of 15FWOU425WG	JK	11/9/2015	1510	X	X	X	X	X	X	580-55009	111001, 02
Groundwater Samples - CAT Shed (Building 1191) Leach Field Area													
15FWOU408WG	AP-10258MW	primary	CB	4/8/2015	1325	X	X	X	X	X	X	580-48876	040901, 02, 04
15FWOU413WG	AP-10257MW	primary/MS/MSD	CB	4/8/2015	1120	X	X	X	X	X	X	580-48876	040901, 02, 06
15FWOU414WG	AP-7070	field duplicate of 15FWOU413WG	CB	4/8/2015	1135	X	X	X	X	X	X	580-48876	040901, 02, 05
15FWOU415WG	AP-10259MW	primary	CB	4/8/2015	1440	X	X	X	X	X	X	580-48876	040901, 02, 06
15FWOU419WG	AP-10258MW	primary	JK	11/6/2015	1150	X	X	X	X	X	X	580-54924	110901, 02
15FWOU420WG	AP-10257MW	primary/MS/MSD	JK	11/6/2015	1330	X	X	X	X	X	X	580-54924	110901, 03
15FWOU421WG	AP-2020	field duplicate of 15FWOU420WG	JK	11/6/2015	1350	X	X	X	X	X	X	580-54924	110901, 03
Performance Evaluation Sample													
15FWOU416WG	AP-6000	PE Sample	--	4/8/2015	1515	X	X	--	X	--	--	580-48876	040901, 02, 06
Trip Blanks													
15FWOU417WQ	Trip Blank	Trip Blank	--	4/7/2015	800	X	--	X	--	--	--	580-48876	040901
15FWOU423WQ	Trip Blank	Trip Blank	--	11/6/2015	800	X	--	X	--	--	--	580-54924	110901
15FWOU427WQ	Trip Blank	Trip Blank	--	11/9/2015	800	X	--	X	--	--	--	580-55009	111001

Note: All samples were submitted to TestAmerica Laboratories (TAL) of Seattle, Washington. TAL-Seattle then subdivided the methane samples and shipped them to TAL of Denver, Colorado, for analysis. The standard 14-day turnaround time was requested for all analyses. All sampling was conducted under NPDL work order number 15-035.

CB - Chris Boese
JK - Josh Klynstra
MS/MSD - matrix spike/matrix spike duplicate
NPDL - North Pacific Division Laboratory
PE - performance evaluation sample
SDG - sample data group
SVOC - semi-volatile organic compounds
VOC - volatile organic compounds

<u>Water Sample Collection</u> (all samples were field-preserved at 4±2°C)
VOC - three HCl-preserved, 40 mL VOA vials
SVOC - two non-preserved, 1L amber bottles
Iron - one HNO_3-preserved, 250 mL HDPE bottle, field-filtered
Sulfate - one non-preserved, 125 mL HDPE bottle
Total Metals - one HNO_3-preserved, 250 mL HDPE bottle
Methane - three HCl-preserved, 40 mL VOA vials

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

Sample ID				15FWOU401WG	15FWOU402WG	15FWOU403WG	15FWOU404WG	15FWOU405WG	15FWOU406WG	15FWOU407WG	15FWOU408WG	15FWOU409WG	15FWOU410WG	15FWOU411WG	15FWOU412WG	15FWOU413WG	15FWOU414WG	15FWOU415WG
Location ID				FWLF-4	AP-6532	AP-6138	AP-6535	AP-8061	AP-6530	AP-5588	AP-10258MW	AP-5589	AP-6136	AP-8063	AP-6060	AP-10257MW	AP-7070	AP-10259MW
Sample Data Group				580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1
Laboratory ID				48876-1	48876-2	48876-3	48876-4	48876-5	48876-6	48876-7	48876-8	48876-9	48876-10	48876-11	48876-12	48876-13	48876-14	48876-15
Collection Date				4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/8/2015	4/7/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015
Matirx				WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary/MS/MSD	Primary
Analyte	**Method**	**Units**	**Cleanup Level**[1]	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result LOD Qualifier**
Methane	RSK175	µg/L	NE	120 [0.37]	3600 [0.37]	190 [0.37]	1100 [0.37]	440 [0.37]	330 [0.37]	1800 [0.37]	480 [0.37]	3400 [0.37]	110 [0.37]	2100 [0.37] J	1500 [0.37] J	2300 [0.37] J	2500 [0.37]	ND [0.37]
Sulfate	E300_28	mg/L	NE	50 [5]	2.3 [0.5]	13 [5]	13 [5]	33 [5]	21 [5]	190 [5]	110 [5]	120 [5]	4.3 [0.5]	4.6 [0.5]	4.3 [0.5]	22 [5]	23 [5]	120 [5]
Iron	SW6010C	µg/L	NE	28000 [360]	28000 [360]	25000 [360]	28000 [360]	34000 [360]	24000 [360]	37000 [360]	ND [360]	50000 [360]	22000 [360]	23000 [360]	24000 [360]	2400 [360]	2500 [360]	ND [360]
Antimony	SW6020A	µg/L	6	ND [1]	0.93 [1] J	ND [1]	0.43 [1] J	ND [1]	ND [1]	ND [1]	1.9 [1] J	ND [1]	0.72 [1] J	0.63 [1] J	0.55 [1] J	1.3 [1] J	1.1 [1] J	0.48 [1] J
Arsenic	SW6020A	µg/L	10	5.7 [4]	**14 [4]**	1.4 [4] J	2.7 [4] J	8.8 [4]	4.3 [4] J	**18 [4]**	ND [4]	ND [4]	1.4 [4] J	4.3 [4] J	4.2 [4] J	1.5 [4] J	1.6 [4] J	ND [4]
Barium	SW6020A	µg/L	2,000	360 [1]	250 [1]	480 [1]	270 [1]	590 [1]	330 [1]	460 [1]	63 [1]	640 [1]	240 [1]	140 [1]	140 [1]	160 [1]	170 [1]	72 [1]
Beryllium	SW6020A	µg/L	4	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]
Cadmium	SW6020A	µg/L	5	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	0.98 [0.3] J	ND [0.3]	0.68 [0.3] J	ND [0.3]	0.22 [0.3] J	0.32 [0.3] J	0.38 [0.3] J	0.17 [0.3] J
Chromium	SW6020A	µg/L	100	ND [1.5]	3.9 [1.5]	1.1 [1.5] J	1.8 [1.5] J	ND [1.5]	ND [1.5]	1.1 [1.5] J	1.4 [1.5] J	1.5 [1.5] J	4.7 [1.5]	4.6 [1.5]	5.4 [1.5]	2.2 [1.5]	2 [1.5]	ND [1.5]
Cobalt	SW6020A	µg/L	NE	6.1 [0.6]	0.37 [0.6] J	ND [0.6]	0.2 [0.6] J	ND [0.6]	ND [0.6]	2.4 [0.6]	56 [0.6]	0.21 [0.6] J	0.97 [0.6] J	1 [0.6] J	0.98 [0.6] J	22 [0.6]	23 [0.6]	0.35 [0.6] J
Copper	SW6020A	µg/L	1,000	4.9 [7.5] J	6.4 [7.5] J	ND [7.5]	5.6 [7.5] J	ND [7.5]	ND [7.5]	ND [7.5]	9.8 [7.5] J	ND [7.5]	ND [7.5]	5.9 [7.5] J	5.7 [7.5] J	9.9 [7.5] J	8.1 [7.5] J	ND [7.5]
Lead	SW6020A	µg/L	15	ND [0.5]	1.3 [0.5] J	0.71 [0.5] J	0.87 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.49 [0.5] J	1.6 [0.5] J	3.7 [0.5]	3.7 [0.5]	0.19 [0.5] J	ND [0.5]	ND [0.5]
Nickel	SW6020A	µg/L	110	6.7 [5] J	8.6 [5] J	ND [5]	ND [5]	ND [5]	ND [5]	3.9 [5] J	**210 [5]**	ND [5]	2.7 [5] J	3.7 [5] J	4.2 [5] J	60 [5]	66 [5]	19 [5]
Selenium	SW6020A	µg/L	50	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	1.8 [4] J	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]
Silver	SW6020A	µg/L	100	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	1.3 [0.35] J	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]
Thallium	SW6020A	µg/L	2	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	1 [2.5] J	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]
Vanadium	SW6020A	µg/L	260	ND [10]	5.7 [10] J	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	5.2 [10] J	6.8 [10] J	7.9 [10] J	8.5 [10] J	ND [10]	ND [10]	ND [10]
Zinc	SW6020A	µg/L	5,000	ND [20]	35 [20]	ND [20]	9.8 [20] J	ND [20]	ND [20]	ND [20]	100 [20]	ND [20]	ND [20]	38 [20]	41 [20]	30 [20] J	35 [20]	ND [20]
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,1,1-Trichloroethane	SW8260C	µg/L	200	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	4.3	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	**1300 [0.5] J**	ND [0.5]	2 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1,2-Trichloroethane	SW8260C	µg/L	5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	**10 [0.5]**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloroethane	SW8260C	µg/L	7300	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	0.74 [1] J	ND [1]	1.7 [1] J	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,1-Dichloroethene	SW8260C	µg/L	7	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,2,3-Trichloropropane	SW8260C	µg/L	0.12	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,2,4-Trichlorobenzene	SW8260C	µg/L	70	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trimethylbenzene	SW8260C	µg/L	1800	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,2-Dibromoethane	SW8260C	µg/L	0.05	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichlorobenzene	SW8260C	µg/L	600	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,2-Dichloroethane	SW8260C	µg/L	5	ND [0.5]	0.24 [0.5] J	ND [0.5]	0.48 [0.5] J	0.37 [0.5] J	ND [0.5]	2.1 [0.5]	ND [0.5]	3.4 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichloropropane	SW8260C	µg/L	5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	1800	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,3-Dichlorobenzene	SW8260C	µg/L	3300	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
1,3-Dichloropropane	SW8260C	µg/L	8.5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,4-Dichlorobenzene	SW8260C	µg/L	75	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
2-Butanone	SW8260C	µg/L	22000	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4] J-	ND [4] J-	ND [4] J-	ND [4] J-	ND [4] J-	ND [4] J-	ND [4] J-	ND [4] J-	ND [4] J-
2-Chlorotoluene	SW8260C	µg/L	NE	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
2-Hexanone	SW8260C	µg/L	NE	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	1.7 [2] J	ND [2]
4-Methyl-2-pentanone	SW8260C	µg/L	2900	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]	ND [8]
Acetone	SW8260C	µg/L	33000	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]
Benzene	SW8260C	µg/L	5	0.88 [1] J	**11 [1]**	3.2 [1]	3 [1]	3.9 [1]	3 [1]	1.8 [1] J	4.9 [1]	3.3 [1]	0.74 [1] J	ND [1]	ND [1]	**14 [1]**	**14 [1]**	ND [1]
Bromobenzene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Bromochloromethane	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Bromodichloromethane	SW8260C	µg/L	14	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Bromoform	SW8260C	µg/L	110	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	51	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Carbon disulfide	SW8260C	µg/L	3700	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Carbon tetrachloride	SW8260C	µg/L	5	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
Chlorobenzene	SW8260C	µg/L	100	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Chloroethane	SW8260C	µg/L	290	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Chloroform	SW8260C	µg/L	140	ND [0.5]	0.36 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.3 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chloromethane	SW8260C	µg/L	66	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
cis-1,2-Dichloroethene	SW8260C	µg/L	70	0.29 [0.5] J	2.4 [0.5]	0.53 [0.5] J	31 [0.5]	8.9 [0.5]	0.62 [0.5] J	**180 [0.5] J**	3.5 [0.5]	14 [0.5] J	ND [0.5]	4.5 [0.5]	4.6 [0.5]	3.1 [0.5]	3.3 [0.5]	ND [0.5]
cis-1,3-Dichloropropene	SW8260C	µg/L	8.5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dibromochloromethane	SW8260C	µg/L	10	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dibromomethane	SW8260C	µg/L	370	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	7300	ND [1]	0.38 [1] J	ND [1]	0.61 [1] J	ND [1]	ND [1]	1.4 [1] J	ND [1]	3.5 [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

Sample ID				15FWOU401WG	15FWOU402WG	15FWOU403WG	15FWOU404WG	15FWOU405WG	15FWOU406WG	15FWOU407WG	15FWOU408WG	15FWOU409WG	15FWOU410WG	15FWOU411WG	15FWOU412WG	15FWOU413WG	15FWOU414WG	15FWOU415WG
Location ID				FWLF-4	AP-6532	AP-6138	AP-6535	AP-8061	AP-6530	AP-5588	AP-10258MW	AP-5589	AP-6136	AP-8063	AP-6060	AP-10257MW	AP-7070	AP-10259MW
Sample Data Group				580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1
Laboratory ID				48876-1	48876-2	48876-3	48876-4	48876-5	48876-6	48876-7	48876-8	48876-9	48876-10	48876-11	48876-12	48876-13	48876-14	48876-15
Collection Date				4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/8/2015	4/7/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015
Matirx				WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary/MS/MSD	Primary
Analyte	**Method**	**Units**	**Cleanup Level^1**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result LOD Qualifier**
Ethylbenzene	SW8260C	µg/L	700	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Hexachlorobutadiene	SW8260C	µg/L	7.3	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
Isopropylbenzene	SW8260C	µg/L	3700	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	0.65 [1] J	0.69 [1] J	ND [1]
Methylene chloride	SW8260C	µg/L	5	2.5 [2] J,B	2.9 [2] J,B	3 [2] J,B	2.8 [2] J,B	2.8 [2] J,B	2.6 [2] J,B	2.4 [2] J,B	ND [2]	2.5 [2] J,B	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	470	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Naphthalene	SW8260C	µg/L	730	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
n-Butylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
n-Propylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
o-Xylene	SW8260C	µg/L	10000	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
sec-Butylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	0.58 [2] J	ND [2]	ND [2]	ND [2]	ND [2]	0.74 [2] J,J-	0.71 [2]J,J-	ND [2]
Styrene	SW8260C	µg/L	100	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
tert-Butylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
Tetrachloroethene (PCE)	SW8260C	µg/L	5	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	2.7 [2] J	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
Toluene	SW8260C	µg/L	1000	ND [1]	0.72 [1] J	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]
trans-1,2-Dichloroethene	SW8260C	µg/L	100	ND [0.5]	0.27 [0.5] J	ND [0.5]	2.7 [0.5]	3.8 [0.5]	ND [0.5]	43 [0.5]	0.32 [0.5] J	2.1 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.51 [0.5] J	0.57 [0.5] J	ND [0.5]
trans-1,3-Dichloropropene	SW8260C	µg/L	8.50	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Trichloroethene (TCE)	SW8260C	µg/L	5	ND [1]	ND [1]	ND [1]	0.55 [1] J	4.5 [1]	ND [1]	**320 [1] J**	ND [1]	4.6 [1] J	ND [1]	0.78 [1] J	0.72 [1] J	ND [1]	ND [1]	ND [1]
Trichlorofluoromethane	SW8260C	µg/L	11000	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]
Vinyl chloride	SW8260C	µg/L	2	ND [0.5]	ND [0.5]	ND [0.5]	1 [0.5]	ND [0.5]	ND [0.5]	0.87 [0.5] J	ND [0.5]	1.1 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Xylene, Isomers m & p	SW8260C	µg/L	10000	ND [0.5]	0.2 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.34 [0.5] J	0.33 [0.5] J	ND [0.5]
1,2,4-Trichlorobenzene	SW8270D	µg/L	70	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
1,2-Dichlorobenzene	SW8270D	µg/L	600	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
1,3-Dichlorobenzene	SW8270D	µg/L	3300	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
1,4-Dichlorobenzene	SW8270D	µg/L	75	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
1-Methylnaphthalene	SW8270D	µg/L	150	ND [0.038]	0.078 [0.044]	ND [0.038]	ND [0.046]	ND [0.038]	ND [0.044]	ND [0.038]	ND [0.038]	ND [0.038]	ND [0.045]	ND [0.045]	ND [0.044]	ND [0.038]	ND [0.038]	ND [0.038]
2,4,5-Trichlorophenol	SW8270D	µg/L	3700	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2,4,6-Trichlorophenol	SW8270D	µg/L	77	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2,4-Dichlorophenol	SW8270D	µg/L	110	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2,4-Dimethylphenol	SW8270D	µg/L	730	ND [0.38]	ND [0.44]	ND [0.38]	ND [0.46]	ND [0.38]	ND [0.44]	ND [0.38]	ND [0.38]	ND [0.38]	ND [0.45]	ND [0.45]	ND [0.44]	ND [0.38]	ND [0.38]	ND [0.38]
2,4-Dinitrophenol	SW8270D	µg/L	73	ND [1.9]	ND [2.2]	ND [1.9]	ND [2.3]	ND [1.9]	ND [2.2]	ND [1.9]	ND [1.9]	ND [1.9]	ND [2.2]	ND [2.2]	ND [2.2]	ND [1.9]	ND [1.9]	ND [1.9]
2,4-Dinitrotoluene	SW8270D	µg/L	1.3	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2,6-Dinitrotoluene	SW8270D	µg/L	1.3	ND [0.19]	**3.6 [0.22]**	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2-Chloronaphthalene	SW8270D	µg/L	2900	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
2-Chlorophenol	SW8270D	µg/L	180	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2-Methyl-4,6-dinitrophenol	SW8270D	µg/L	NE	ND [1.9]	ND [2.2]	ND [1.9]	ND [2.3]	ND [1.9]	ND [2.2]	ND [1.9]	ND [1.9]	ND [1.9]	ND [2.2]	ND [2.2]	ND [2.2]	ND [1.9]	ND [1.9]	ND [1.9]
2-Methylnaphthalene	SW8270D	µg/L	150	ND [0.029]	0.099 [0.033] J	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
2-Methylphenol (o-Cresol)	SW8270D	µg/L	1800	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2-Nitroaniline	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
2-Nitrophenol	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
3,3'-Dichlorobenzidine	SW8270D	µg/L	1.90	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22] R	ND [0.22] R	ND [0.19] R	ND [0.19] R	ND [0.19]
3 & 4-Methylphenol Coelution	SW8270D	µg/L	180	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	0.12 [0.19] J	0.1 [0.19] J	ND [0.19]
3-Nitroaniline	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	0.4 [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19] J-	ND [0.19] J-	ND [0.19]
4-Bromophenyl phenyl ether	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
4-Chloro-3-methylphenol	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
4-Chloroaniline	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19] J-	ND [0.19] J-	ND [0.19]
4-Chlorophenyl phenyl ether	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
4-Nitroaniline	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22] J-	ND [0.22] J-	ND [0.19] J-	ND [0.19] J-	ND [0.19]
4-Nitrophenol	SW8270D	µg/L	NE	ND [1.9]	ND [2.2]	ND [1.9]	ND [2.3]	ND [1.9]	ND [2.2]	ND [1.9]	ND [1.9]	ND [1.9]	ND [2.2]	ND [2.2]	ND [2.2]	ND [1.9]	ND [1.9]	ND [1.9]
Acenaphthene	SW8270D	µg/L	2200	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Acenaphthylene	SW8270D	µg/L	2200	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Anthracene	SW8270D	µg/L	11000	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Benzo(a)anthracene	SW8270D	µg/L	1.2	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Benzo(a)pyrene	SW8270D	µg/L	0.2	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Benzo(b)fluoranthene	SW8270D	µg/L	1.2	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Benzo(g,h,i)perylene	SW8270D	µg/L	1100	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Benzo(k)fluoranthene	SW8270D	µg/L	12	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Benzoic acid	SW8270D	µg/L	150000	ND [0.96]	1.2 [1.1] J	ND [0.96]	ND [1.1]	1 [0.96] J	ND [1.1]	0.94 [0.96] J	ND [0.95]	ND [0.96]	ND [1.1]	ND [1.1]	ND [1.1]	9.9 [0.95] J-	7.9 [0.95] J-	ND [0.95]
Benzyl alcohol	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Benzyl butyl phthalate	SW8270D	µg/L	7300	ND [0.38]	0.39 [0.44] J	ND [0.38]	ND [0.46]	0.23 [0.38] J	ND [0.44]	ND [0.38]	ND [0.38]	0.19 [0.38] J	ND [0.45]	ND [0.45]	ND [0.44]	0.24 [0.38] J	0.32 [0.38] J	ND [0.38]
bis-(2-Chloroethoxy)methane	SW8270D	µg/L	NE	ND [0.19] J-	ND [0.22] J-	ND [0.19] J-	ND [0.23] J-	ND [0.19] J-	ND [0.22] J-	ND [0.19] J-	ND [0.19] J-	ND [0.19] J-	ND [0.22] J-	ND [0.22] J-	ND [0.22] J-	ND [0.19] J-	0.12 [0.19] J,J-	ND [0.19] J-
bis-(2-Chloroethyl)ether	SW8270D	µg/L	0.77	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
bis(2-Chloroisopropyl)ether	SW8270D	µg/L	NE	ND [0.19]	ND [0.22]	ND [0.19]	0.11 [0.23] J	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/L	6	**9.5 [1.9]**	**20 [22] J**	ND [1.9]	ND [2.3]	ND [1.9]	ND [2.2]	1.2 [1.9] J	ND [1.9]	ND [1.9]	ND [2.2]	2.8 [2.2] J	5.7 [2.2] J	2.1 [1.9] J	4.1 [1.9] J	ND [1.9]

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

			Sample ID	15FWOU401WG	15FWOU402WG	15FWOU403WG	15FWOU404WG	15FWOU405WG	15FWOU406WG	15FWOU407WG	15FWOU408WG	15FWOU409WG	15FWOU410WG	15FWOU411WG	15FWOU412WG	15FWOU413WG	15FWOU414WG	15FWOU415WG
			Location ID	FWLF-4	AP-6532	AP-6138	AP-6535	AP-8061	AP-6530	AP-5588	AP-10258MW	AP-5589	AP-6136	AP-8063	AP-6060	AP-10257MW	AP-7070	AP-10259MW
			Sample Data Group	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1	580-48876-1
			Laboratory ID	48876-1	48876-2	48876-3	48876-4	48876-5	48876-6	48876-7	48876-8	48876-9	48876-10	48876-11	48876-12	48876-13	48876-14	48876-15
			Collection Date	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/7/2015	4/8/2015	4/7/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015	4/8/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary/MS/MSD	Primary
Analyte	**Method**	**Units**	**Cleanup Level[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result LOD Qualifier**
Carbazole	SW8270D	µg/L	43	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Chrysene	SW8270D	µg/L	120	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Dibenzo(a,h)anthracene	SW8270D	µg/L	0.12	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Dibenzofuran	SW8270D	µg/L	73	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Diethyl phthalate	SW8270D	µg/L	29000	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Dimethyl phthalate	SW8270D	µg/L	370000	ND [0.19]	30 [2.2]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Di-n-butyl phthalate	SW8270D	µg/L	3700	ND [0.19]	0.26 [0.22] J	0.14 [0.19] J	ND [0.23]	0.18 [0.19] J	ND [0.22]	0.17 [0.19] J	0.14 [0.19] J	0.13 [0.19] J	ND [0.22]	ND [0.22]	ND [0.22]	0.12 [0.19] J	0.33 [0.19] J	0.13 [0.19] J
Di-n-octyl phthalate	SW8270D	µg/L	1500	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Fluoranthene	SW8270D	µg/L	1500	ND [0.029]	0.079 [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Fluorene	SW8270D	µg/L	1500	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Hexachlorobenzene	SW8270D	µg/L	1	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Hexachlorobutadiene	SW8270D	µg/L	7.3	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Hexachlorocyclopentadiene	SW8270D	µg/L	50	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Hexachloroethane	SW8270D	µg/L	40	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Indeno(1,2,3-cd)pyrene	SW8270D	µg/L	1.20	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Isophorone	SW8270D	µg/L	900	ND [0.19] J-	ND [0.22] J-	ND [0.19] J-	ND [0.23] J-	ND [0.19] J-	ND [0.22] J-	ND [0.19] J-	ND [0.19] J-	0.13 [0.19] J,J-	ND [0.22] J-	ND [0.22] J-	ND [0.22] J-	ND [0.19] J-	ND [0.19] J-	ND [0.19] J-
Naphthalene	SW8270D	µg/L	730	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Nitrobenzene	SW8270D	µg/L	18	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	0.13 [0.19] J	ND [0.19]
n-Nitrosodi-n-propylamine	SW8270D	µg/L	0.12	ND [0.19] J-	ND [0.22] J-	ND [0.19] J-	ND [0.23] J-	ND [0.19] J-	ND [0.22] J-	ND [0.19] J-	ND [0.19] J-	ND [0.19] J-	ND [0.22] J-	ND [0.22] J-	ND [0.22] J-	ND [0.19] J-	ND [0.19] J-	ND [0.19] J-
n-Nitrosodiphenylamine	SW8270D	µg/L	170	ND [0.19]	0.5 [0.22]	ND [0.19]	ND [0.23]	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Pentachlorophenol	SW8270D	µg/L	1	0.19 [0.19] J	ND [0.22]	0.2 [0.19] J	ND [0.23]	ND [0.19]	ND [0.22]	0.19 [0.19] J	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]
Phenanthrene	SW8270D	µg/L	11000	ND [0.029]	0.075 [0.033] J	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]
Phenol	SW8270D	µg/L	11000	ND [0.19]	1.2 [0.22]	ND [0.19]	0.17 [0.23] J	ND [0.19]	ND [0.22]	ND [0.19]	ND [0.19]	ND [0.19]	ND [0.22]	ND [0.22]	ND [0.22]	0.55 [0.19] J-	0.56 [0.19] J-	ND [0.19]
Pyrene	SW8270D	µg/L	1100	ND [0.029]	0.26 [0.033]	ND [0.029]	ND [0.034]	ND [0.029]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]	ND [0.033]	ND [0.034]	ND [0.033]	ND [0.029]	ND [0.029]	ND [0.029]

Yellow highlighted and **bolded** results exceed ADEC groundwater cleanup levels.

Grey highlighted results are non-detect with LODs above cleanup levels

[1] Cleanup level etablished from ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C

Data Qualifiers:

B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ or due to a QC failure
J+ - result qualified as estimate with a high-bias due to a QC failure
J- - result qualified as estimate with a low-bias due to a QC failure
ND - not detected [LOD presented in brackets]

Acronyms:

LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
mg/L - milligrams per liter
NE - not established
PE - performance evaluation sample
WG - groundwater
WQ - water QC sample

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

			Sample ID	15FWOU418WG	15FWOU419WG	15FWOU420WG	15FWOU421WG	15FWOU422WG	15FWOU424WG	15FWOU425WG	15FWOU426WG	15FWOU416WG	15FWOU417WQ	15FWOU423WQ	15FWOU427WQ
			Location ID	AP-8061	AP-10258MW	AP-10257MW	AP-2020	AP-6530	AP-6532	AP-6535	AP-4040	AP-6000	Trip Blank	Trip Blank	Trip Blank
			Sample Data Group	580-54924-1	580-54924-1	580-54924-1	580-54924-1	580-54924-1	580-55009-1	580-55009-1	580-55009-1	580-48876-1	580-48876-1	580-54924-1	580-55009-1
			Laboratory ID	54924-1	54924-2	54924-3	54924-4	54924-5	55009-1	55009-2	55009-3	48876-16	48876-17	54924-6	55009-4
			Collection Date	11/6/2015	11/6/2015	11/6/2015	11/6/2015	11/6/2015	11/9/2015	11/9/2015	11/9/2015	4/8/2015	4/7/2015	11/6/2015	11/9/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG	WG	WG	WQ	WQ	WQ
			Sample Type	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary	Primary/MS/MSD	Field Duplicate	PE Sample	Trip Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**	**Cleanup Level[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Methane	RSK175	µg/L	NE	630 [0.8]	680 [0.8]	2700 [0.8]	2300 [0.8]	120 [0.8]	1500 [0.8]	1600 [0.8] J	1300 [0.8]	-	ND [0.37]	ND [0.8]	ND [0.8]
Sulfate	E300_28	mg/L	NE	40 [0.4]	120 [4]	270 [4]	270 [4]	16 [4]	3.4 [0.4]	18 [0.4] J,J+	18 [0.4] J+	-	-	-	-
Iron	SW6010C	µg/L	NE	30000 [360]	ND [360]	ND [360]	ND [360]	20000 [360]	27000 [360]	29000 [360]	30000 [360]	-	-	-	-
Antimony	SW6020A	µg/L	6	ND [1]	0.67 [1] J	1.9 [1] J	1.8 [1] J	ND [1]	1 [1]	ND [1]	ND [1]	280 [1]	-	-	-
Arsenic	SW6020A	µg/L	10	9.6 [4]	ND [4]	ND [4]	ND [4]	4.8 [4] J	ND [4]	2.4 [4] J	2.2 [4] J	140 [4]	-	-	-
Barium	SW6020A	µg/L	2,000	590 [1]	91 [1]	200 [1]	200 [1]	320 [1]	240 [1]	270 [1]	270 [1]	830 [1]	-	-	-
Beryllium	SW6020A	µg/L	4	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	ND [1.3]	220 [1.3]	-	-	-
Cadmium	SW6020A	µg/L	5	ND [0.3]	1.1 [0.3] J	1.1 [0.3] J	0.99 [0.3] J	ND [0.3]	0.21 [0.3] J	0.27 [0.3] J,J+	ND [0.3]	450 [0.3]	-	-	-
Chromium	SW6020A	µg/L	100	1.1 [1.5] J	ND [1.5]	1.2 [1.5] J	1 [1.5] J	0.76 [1.5] J	1.7 [1.5] J	1.6 [1.5] J	1.3 [1.5] J	360 [1.5]	-	-	-
Cobalt	SW6020A	µg/L	NE	ND [0.6]	100 [0.6]	26 [0.6]	26 [0.6]	ND [0.6]	0.34 [0.6] J	ND [0.6]	ND [0.6]	580 [0.6]	-	-	-
Copper	SW6020A	µg/L	1,000	ND [7.5]	9.3 [7.5] J	15 [7.5]	15 [7.5]	ND [7.5]	ND [7.5]	ND [7.5]	ND [7.5]	270 [7.5]	-	-	-
Lead	SW6020A	µg/L	15	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	1.6 [0.5] J	0.52 [0.5] J,J+	0.39 [0.5] J,J+	860 [0.5]	-	-	-
Nickel	SW6020A	µg/L	110	ND [5]	**240 [5]**	77 [5]	75 [5]	ND [5]	2.4 [5] J	ND [5]	ND [5]	550 [5]	-	-	-
Selenium	SW6020A	µg/L	50	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	840 [4]	-	-	-
Silver	SW6020A	µg/L	100	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	ND [0.35]	860 [0.35]	-	-	-
Thallium	SW6020A	µg/L	2	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	620 [2.5]	-	-	-
Vanadium	SW6020A	µg/L	260	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	1100 [10]	-	-	-
Zinc	SW6020A	µg/L	5,000	ND [20]	180 [20]	68 [20]	68 [20]	ND [20]	17 [20] J	ND [20]	ND [20]	940 [20]	-	-	-
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,1,1-Trichloroethane	SW8260C	µg/L	200	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	5.2 [2]	ND [2]	ND [2]	ND [2]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	4.3	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	14 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1,2-Trichloroethane	SW8260C	µg/L	5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	2.7 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloroethane	SW8260C	µg/L	7300	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,1-Dichloroethene	SW8260C	µg/L	7	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	7.5 [1]	ND [1]	ND [1]	ND [1]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,2,3-Trichloropropane	SW8260C	µg/L	0.12	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,2,4-Trichlorobenzene	SW8260C	µg/L	70	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	16 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trimethylbenzene	SW8260C	µg/L	1800	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,2-Dibromoethane	SW8260C	µg/L	0.05	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichlorobenzene	SW8260C	µg/L	600	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	7 [1]	ND [1]	ND [1]	ND [1]
1,2-Dichloroethane	SW8260C	µg/L	5	0.52 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	0.22 [0.5] J	0.39 [0.5] J	0.42 [0.5] J,J-	13 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichloropropane	SW8260C	µg/L	5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	3.1 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	1800	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,3-Dichlorobenzene	SW8260C	µg/L	3300	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
1,3-Dichloropropane	SW8260C	µg/L	8.5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,4-Dichlorobenzene	SW8260C	µg/L	75	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	12 [1]	ND [1]	ND [1]	ND [1]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
2-Butanone	SW8260C	µg/L	22000	ND [4]	ND [4]	ND [4]	ND [4]	ND [4] J-	ND [4]	ND [4]	ND [4] J-	ND [4] J-	ND [4]	ND [4]	ND [4]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
2-Hexanone	SW8260C	µg/L	NE	ND [8]	ND [8]	ND [8]	ND [8]	ND [8] J-	ND [8]	ND [8]	ND [8] J-	ND [8]	ND [8]	ND [8]	ND [8]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
4-Methyl-2-pentanone	SW8260C	µg/L	2900	ND [8]	ND [8]	ND [8]	ND [8]	ND [8] J-	ND [8] J-	ND [8] J-	ND [8] J-	ND [8]	ND [8]	ND [8]	ND [8]
Acetone	SW8260C	µg/L	33000	ND [20]	ND [20]	ND [20]	ND [20]	ND [20] J-	ND [20]	ND [20]	ND [20] J-	ND [20]	ND [20]	ND [20]	ND [20]
Benzene	SW8260C	µg/L	5	**5.4 [1]**	3.4 [1]	**7.4 [1] J,J+**	**5.3 [1] J,J+**	1.9 [1] J-	**11 [1]**	3.4 [1] J	3.4 [1] J-	16 [1]	ND [1]	ND [1]	ND [1]
Bromobenzene	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Bromochloromethane	SW8260C	µg/L	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Bromodichloromethane	SW8260C	µg/L	14	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Bromoform	SW8260C	µg/L	110	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	51	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Carbon disulfide	SW8260C	µg/L	3700	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	0.47 [0.5] J,J-,B	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Carbon tetrachloride	SW8260C	µg/L	5	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	5.1 [2]	ND [2]	ND [2]	ND [2]
Chlorobenzene	SW8260C	µg/L	100	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	3.6 [1]	ND [1]	ND [1]	ND [1]
Chloroethane	SW8260C	µg/L	290	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Chloroform	SW8260C	µg/L	140	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	0.44 [0.5] J	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chloromethane	SW8260C	µg/L	66	ND [2]	1.3 [2] J	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
cis-1,2-Dichloroethene	SW8260C	µg/L	70	9.7 [0.5]	2.9 [0.5]	3.1 [0.5] J,J+	1.9 [0.5] J,J+	0.26 [0.5] J,J-	2.8 [0.5]	33 [0.5] J	33 [0.5] J-	12 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,3-Dichloropropene	SW8260C	µg/L	8.5	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dibromochloromethane	SW8260C	µg/L	10	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dibromomethane	SW8260C	µg/L	370	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	7300	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	0.38 [1] J,J+	0.78 [1] J,J+	0.69 [1] J,J-,J+	ND [1]	ND [1]	ND [1]	ND [1]

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

			Sample ID	15FWOU418WG	15FWOU419WG	15FWOU420WG	15FWOU421WG	15FWOU422WG	15FWOU424WG	15FWOU425WG	15FWOU426WG	15FWOU416WG	15FWOU417WQ	15FWOU423WQ	15FWOU427WQ
			Location ID	AP-8061	AP-10258MW	AP-10257MW	AP-2020	AP-6530	AP-6532	AP-6535	AP-4040	AP-6000	Trip Blank	Trip Blank	Trip Blank
			Sample Data Group	580-54924-1	580-54924-1	580-54924-1	580-54924-1	580-54924-1	580-55009-1	580-55009-1	580-55009-1	580-48876-1	580-48876-1	580-54924-1	580-55009-1
			Laboratory ID	54924-1	54924-2	54924-3	54924-4	54924-5	55009-1	55009-2	55009-3	48876-16	48876-17	54924-6	55009-4
			Collection Date	11/6/2015	11/6/2015	11/6/2015	11/6/2015	11/6/2015	11/9/2015	11/9/2015	11/9/2015	4/8/2015	4/7/2015	11/6/2015	11/9/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG	WG	WG	WQ	WQ	WQ
			Sample Type	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary	Primary/MS/MSD	Field Duplicate	PE Sample	Trip Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**	**Cleanup Level**[1]	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Ethylbenzene	SW8260C	µg/L	700	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Hexachlorobutadiene	SW8260C	µg/L	7.3	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Isopropylbenzene	SW8260C	µg/L	3700	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1]	ND [1]
Methylene chloride	SW8260C	µg/L	5	ND [2]	ND [2]	ND [2]	ND [2]	1.5 [2] J,J-	ND [2]	ND [2]	1.3 [2] J,J-,J+,B	9.6 [2]	3.7 [2] J,B	2 [2] J,B	1.9 [2] J
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	470	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Naphthalene	SW8260C	µg/L	730	0.43 [1] J,B	ND [1]	0.6 [1] J,J+,B	ND [1]	0.33 [1] J,J-	ND [1]	ND [1]	0.38 [1] J,J-,B	ND [1]	ND [1]	0.47 [1] J,B	0.32 [1] J
n-Butylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
n-Propylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
o-Xylene	SW8260C	µg/L	10000	ND [1]	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	ND [1]	ND [1] J-	11 [1]	ND [1]	ND [1]	ND [1]
sec-Butylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
Styrene	SW8260C	µg/L	100	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	3.8 [2] J	ND [2]	ND [2]	ND [2]
tert-Butylbenzene	SW8260C	µg/L	370	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
Tetrachloroethene (PCE)	SW8260C	µg/L	5	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	6.6 [2]	ND [2]	ND [2]	ND [2]
Toluene	SW8260C	µg/L	1000	ND [1]	ND [1]	1.6 [1] J+	1.1 [1] J+	ND [1] J-	1.3 [1] J	ND [1]	0.54 [1] J,J-	6.9 [1]	ND [1]	ND [1]	ND [1]
trans-1,2-Dichloroethene	SW8260C	µg/L	100	4.3 [0.5]	0.39 [0.5] J	ND [0.5]	0.3 [0.5] J	ND [0.5] J-	0.53 [0.5] J	3.3 [0.5] J	3 [0.5] J-	10 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
trans-1,3-Dichloropropene	SW8260C	µg/L	8.50	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Trichloroethene (TCE)	SW8260C	µg/L	5	**7 [1]**	ND [1]	ND [1]	ND [1]	ND [1] J-	ND [1]	0.6 [1] J	0.59 [1] J,J-	10 [1]	ND [1]	ND [1]	ND [1]
Trichlorofluoromethane	SW8260C	µg/L	11000	ND [2]	ND [2]	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2] J-	ND [2]	ND [2]	ND [2]	ND [2]
Vinyl chloride	SW8260C	µg/L	2	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	0.25 [0.5] J	ND [0.5]	ND [0.5] J-	5.7 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Xylene, Isomers m & p	SW8260C	µg/L	10000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	0.45 [0.5] J	0.21 [0.5] J	0.32 [0.5] J,J-,B	13 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trichlorobenzene	SW8270D	µg/L	70	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
1,2-Dichlorobenzene	SW8270D	µg/L	600	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
1,3-Dichlorobenzene	SW8270D	µg/L	3300	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
1,4-Dichlorobenzene	SW8270D	µg/L	75	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
1-Methylnaphthalene	SW8270D	µg/L	150	ND [0.043]	ND [0.04]	ND [0.042]	ND [0.042]	ND [0.043]	ND [0.22] J+	ND [0.04]	ND [0.042]	ND [0.04]	-	-	-
2,4,5-Trichlorophenol	SW8270D	µg/L	3700	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
2,4,6-Trichlorophenol	SW8270D	µg/L	77	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
2,4-Dichlorophenol	SW8270D	µg/L	110	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
2,4-Dimethylphenol	SW8270D	µg/L	730	ND [0.43] J-	ND [0.4] J-	ND [0.42] J-	ND [0.42] J-	ND [0.43] J-	ND [2.2] J+	ND [0.4] J-	ND [0.42] J-	ND [0.4]	-	-	-
2,4-Dinitrophenol	SW8270D	µg/L	73	ND [2.1] J-	ND [2] J-	ND [2.1] J-	ND [2.1] J-	ND [2.2] J-	ND [11] J-,J+	ND [2] J-	ND [2.1] J-	ND [2]	-	-	-
2,4-Dinitrotoluene	SW8270D	µg/L	1.3	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2] J-	ND [0.21] J-	ND [0.2]	-	-	-
2,6-Dinitrotoluene	SW8270D	µg/L	1.3	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	**4.8 [1.1] J+**	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
2-Chloronaphthalene	SW8270D	µg/L	2900	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
2-Chlorophenol	SW8270D	µg/L	180	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
2-Methyl-4,6-dinitrophenol	SW8270D	µg/L	NE	ND [2.1] J-	ND [2] J-	ND [2.1] J-	ND [2.1] J-	ND [2.2] J-	ND [11] J-,J+	ND [2] J-	ND [2.1] J-	ND [2]	-	-	-
2-Methylnaphthalene	SW8270D	µg/L	150	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
2-Methylphenol (o-Cresol)	SW8270D	µg/L	1800	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
2-Nitroaniline	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
2-Nitrophenol	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2] J-	ND [0.21] J-	ND [0.2]	-	-	-
3,3'-Dichlorobenzidine	SW8270D	µg/L	1.90	ND [0.21] R	ND [0.2] R	ND [0.21] R	ND [0.21] R	ND [0.22] R	ND [1.1] J+,R	ND [0.2] R	ND [0.21] R	ND [0.2]	-	-	-
3 & 4-Methylphenol Coelution	SW8270D	µg/L	180	ND [0.21]	ND [0.2]	0.38 [0.21] J	0.51 [0.21] J	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
3-Nitroaniline	SW8270D	µg/L	NE	ND [0.21] J-	ND [0.2] J-	ND [0.21] J-,R	ND [0.21] J-,R	ND [0.22] J-	ND [1.1] J-,J+	ND [0.2] R	ND [0.21] R	ND [0.2]	-	-	-
4-Bromophenyl phenyl ether	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
4-Chloro-3-methylphenol	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
4-Chloroaniline	SW8270D	µg/L	NE	ND [0.21] R	ND [0.2] R	ND [0.21] R	ND [0.21] R	ND [0.22] R	ND [1.1] J+,R	ND [0.2] R	ND [0.21] R	ND [0.2]	-	-	-
4-Chlorophenyl phenyl ether	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
4-Nitroaniline	SW8270D	µg/L	NE	ND [0.21] J-	ND [0.2] J-	ND [0.21] J-	ND [0.21] J-	ND [0.22] J-	ND [1.1] J-,J+	ND [0.2] J-	ND [0.21] J-	ND [0.2]	-	-	-
4-Nitrophenol	SW8270D	µg/L	NE	ND [2.1]	ND [2]	ND [2.1]	ND [2.1]	ND [2.2]	ND [11] J+	ND [2]	ND [2.1]	ND [2]	-	-	-
Acenaphthene	SW8270D	µg/L	2200	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Acenaphthylene	SW8270D	µg/L	2200	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03] J-	ND [0.031] J-	ND [0.03]	-	-	-
Anthracene	SW8270D	µg/L	11000	ND [0.032] J-	ND [0.03] J-	ND [0.032] J-	ND [0.031] J-	ND [0.032] J-	ND [0.16] J-,J+	ND [0.03] J-	ND [0.031] J-	ND [0.03]	-	-	-
Benzo(a)anthracene	SW8270D	µg/L	1.2	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Benzo(a)pyrene	SW8270D	µg/L	0.2	ND [0.032]	ND [0.03]	ND [0.032] J-	ND [0.031] J-	ND [0.032]	ND [0.16] J+	ND [0.03] J-	ND [0.031] J-	ND [0.03]	-	-	-
Benzo(b)fluoranthene	SW8270D	µg/L	1.2	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Benzo(g,h,i)perylene	SW8270D	µg/L	1100	ND [0.032]	ND [0.03]	ND [0.032] J-	ND [0.031] J-	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Benzo(k)fluoranthene	SW8270D	µg/L	12	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Benzoic acid	SW8270D	µg/L	150000	ND [1.1]	1.2 [1] J	0.94 [1.1] J,J+	ND [1]	1.2 [1.1] J	ND [5.4] J+	ND [0.99]	1 [1] J	ND [1]	-	-	-
Benzyl alcohol	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2] J-	ND [0.21] J-	ND [0.2]	-	-	-
Benzyl butyl phthalate	SW8270D	µg/L	7300	ND [0.43]	ND [0.4]	ND [0.42] J	0.64 [0.42] J,J+,B	ND [0.43]	ND [2.2] J+	ND [0.4]	ND [0.42]	ND [0.4]	-	-	-
bis-(2-Chloroethoxy)methane	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2] J	ND [0.21] J	ND [0.2] J-	-	-	-
bis-(2-Chloroethyl)ether	SW8270D	µg/L	0.77	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
bis(2-Chloroisopropyl)ether	SW8270D	µg/L	NE	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	0.57 [0.21]	ND [0.2]	-	-	-
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/L	6	ND [2.1]	ND [2]	ND [2.1] J	**14 [2.1] J,J+**	3.5 [2.2] J+	**19 [11] J+**	ND [2]	ND [2.1]	16 [20] J	-	-	-

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

			Sample ID	15FWOU418WG	15FWOU419WG	15FWOU420WG	15FWOU421WG	15FWOU422WG	15FWOU424WG	15FWOU425WG	15FWOU426WG	15FWOU416WG	15FWOU417WQ	15FWOU423WQ	15FWOU427WQ
			Location ID	AP-8061	AP-10258MW	AP-10257MW	AP-2020	AP-6530	AP-6532	AP-6535	AP-4040	AP-6000	Trip Blank	Trip Blank	Trip Blank
			Sample Data Group	580-54924-1	580-54924-1	580-54924-1	580-54924-1	580-54924-1	580-55009-1	580-55009-1	580-55009-1	580-48876-1	580-48876-1	580-54924-1	580-55009-1
			Laboratory ID	54924-1	54924-2	54924-3	54924-4	54924-5	55009-1	55009-2	55009-3	48876-16	48876-17	54924-6	55009-4
			Collection Date	11/6/2015	11/6/2015	11/6/2015	11/6/2015	11/6/2015	11/9/2015	11/9/2015	11/9/2015	4/8/2015	4/7/2015	11/6/2015	11/9/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG	WG	WG	WQ	WQ	WQ
			Sample Type	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary	Primary/MS/MSD	Field Duplicate	PE Sample	Trip Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**	**Cleanup Level**^{1}	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Carbazole	SW8270D	µg/L	43	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Chrysene	SW8270D	µg/L	120	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Dibenzo(a,h)anthracene	SW8270D	µg/L	0.12	ND [0.032]	ND [0.03]	ND [0.032] J-	ND [0.031] J-	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Dibenzofuran	SW8270D	µg/L	73	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Diethyl phthalate	SW8270D	µg/L	29000	0.34 [0.21] J,B	0.29 [0.2] J,B	0.33 [0.21] J,B	0.29 [0.21] J,B	0.3 [0.22] J,B	1.7 [1.1] J,J+,B	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Dimethyl phthalate	SW8270D	µg/L	370000	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	0.91 [1.1] J,J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Di-n-butyl phthalate	SW8270D	µg/L	3700	ND [0.21]	ND [0.2]	ND [0.21]	0.28 [0.21] J+,B	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Di-n-octyl phthalate	SW8270D	µg/L	1500	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Fluoranthene	SW8270D	µg/L	1500	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Fluorene	SW8270D	µg/L	1500	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Hexachlorobenzene	SW8270D	µg/L	1	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Hexachlorobutadiene	SW8270D	µg/L	7.3	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Hexachlorocyclopentadiene	SW8270D	µg/L	50	ND [0.21] J-	ND [0.2] J-	ND [0.21] J-	ND [0.21] J-	ND [0.22] J-	ND [1.1] J-,J+	ND [0.2] R	ND [0.21] R	ND [0.2]	-	-	-
Hexachloroethane	SW8270D	µg/L	40	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Indeno(1,2,3-cd)pyrene	SW8270D	µg/L	1.20	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Isophorone	SW8270D	µg/L	900	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2] J-	-	-	-
Naphthalene	SW8270D	µg/L	730	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Nitrobenzene	SW8270D	µg/L	18	ND [0.21]	0.69 [0.2]	ND [0.21]	ND [0.21]	1.1 [0.22]	ND [1.1] J+	ND [0.2] J	1.7 [0.21] J	ND [0.2]	-	-	-
n-Nitrosodi-n-propylamine	SW8270D	µg/L	0.12	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J-,J+	ND [0.2] J-	ND [0.21] J-	ND [0.2] J-	-	-	-
n-Nitrosodiphenylamine	SW8270D	µg/L	170	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	0.55 [1.1] J,J+	ND [0.2] J-	ND [0.21] J-	ND [0.2]	-	-	-
Pentachlorophenol	SW8270D	µg/L	1	ND [0.21]	ND [0.2]	ND [0.21]	ND [0.21]	ND [0.22]	ND [1.1] J+	ND [0.2]	ND [0.21]	ND [0.2]	-	-	-
Phenanthrene	SW8270D	µg/L	11000	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-
Phenol	SW8270D	µg/L	11000	0.43 [0.21] J	ND [0.2]	0.26 [0.21] J	0.16 [0.21] J	0.22 [0.22] J	1.4 [1.1] J,J+	0.25 [0.2] J	0.32 [0.21] J	ND [0.2]	-	-	-
Pyrene	SW8270D	µg/L	1100	ND [0.032]	ND [0.03]	ND [0.032]	ND [0.031]	ND [0.032]	ND [0.16] J+	ND [0.03]	ND [0.031]	ND [0.03]	-	-	-

Yellow highlighted and **bolded** results exceed ADEC groundwater cleanup levels.

Grey highlighted results are non-detect with LODs above cleanup levels

^{1} Cleanup level established from ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C

Data Qualifiers:

B - result may be due to cross-contamination

J - result qualified as estimate because it is less than the LOQ or due to a QC failure

J+ - result qualified as estimate with a high-bias due to a QC failure

J- - result qualified as estimate with a low-bias due to a QC failure

ND - not detected [LOD presented in brackets]

Acronyms:

LOD - limit of detection

LOQ - limit of quantitation

MS/MSD - matrix spike/matrix spike duplicate

µg/L - micrograms per liter

mg/L - milligrams per liter

NE - not established

PE - performance evaluation sample

WG - groundwater

WQ - water QC sample

APPENDIX D

PHOTO LOG

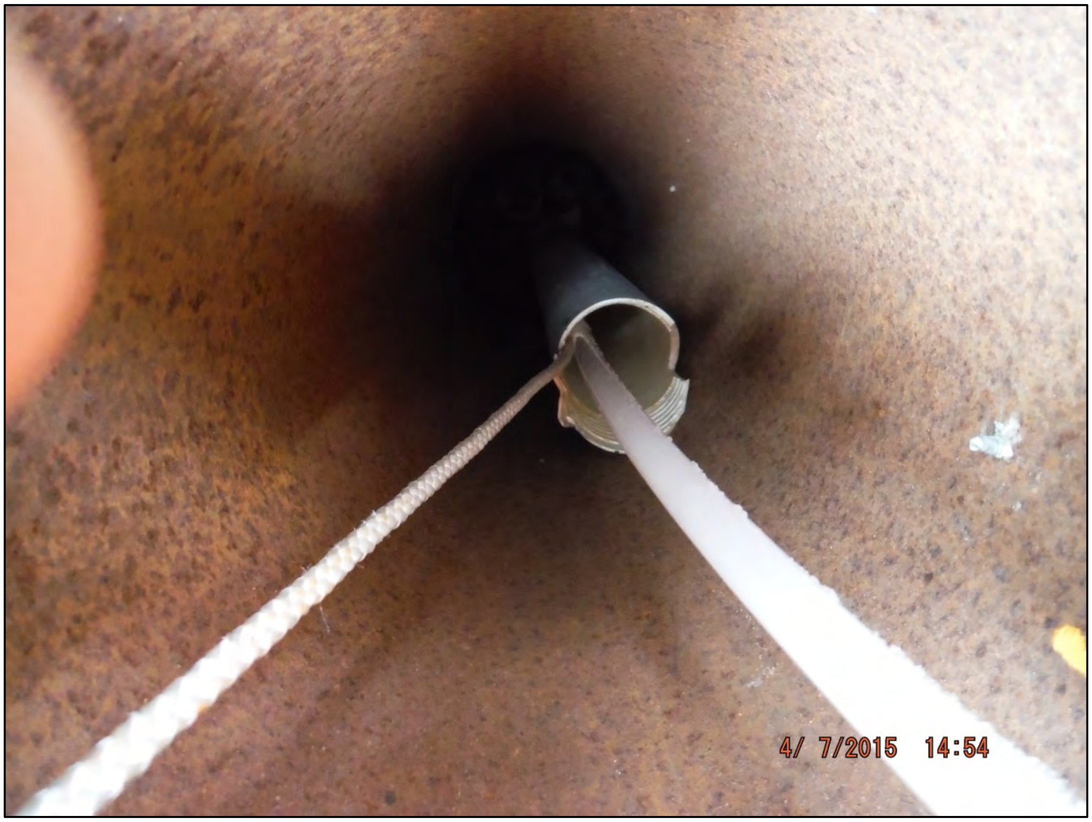
2015 GROUNDWATER SAMPLING LOG – OU4

Landfill groundwater sampling at AP-10258 (view to the East)

Landfill groundwater sampling at FWLF-4 (view to the West)

Thawing well AP-6532 with hot water due to failed dedicated heat trace.

Collecting groundwater parameters at AP-6138 (view NA)



View of broken PVC riser at AP-5588

Temporary storage of IDW purgewater at the DERA building

APPENDIX E

FFA MEETING KEY DECISION ITEMS

Discussion Items/Key Decisions fromWinter 2015 FFA Meeting, Ft Wainwright, AK

Operable Units and Two-Party Sites

February 3-4, 2015
Anchorage, AK

U.S. Environmental Protection Agency (EPA)	Sandy Halstead (Feb. 3rd only)
Alaska Dept. of Environmental Conservation (ADEC)	Deb Caillouet
Army Environmental Command (AEC)	Michael Kipp
Army Directorate of Public Works-Environmental (DPW)	Joe Malen, Brian Adams, Michael Meeks (Feb. 4th only)
U.S. Army Corps of Engineers (USACE)	Bob Hazlett, Mark Wallace, Mike Utley
Fairbanks Environmental Services (FES)	Craig Martin, Aaron Swank, Karol Johnson, Bryan Johnson

NOTE: Discussion items/key decisions are listed in the table based on the order the sites or topics were discussed.

Site / Topic	Discussion Items / Key Decision	Responsible Party	Follow-up Actions
Tuesday, February 3rd			
2014 Postwide Monitoring Program Summary	Sampling was conducted late in 2014 as a result of contracting delays and additional time required to prepare and approve UFP-QAPP.	USACE	A 2015 contract option is planned for award prior to spring sampling.
	Discussed the potential impact of record precipitation during the summer of 2014 on groundwater contaminant concentrations.	FES	Will continue to monitor groundwater contaminant concentrations to determine influence of high water levels.
	Discussed the use of EPA's groundwater statistical tool and how it could be incorporated into the existing analysis process (i.e. MAROS, linear regression).	FES	Army will evaluate the use of this tool, using the 2014 monitoring data sets.
OU1 – 801 Drum Burial Site	Discussed planned 2015 groundwater sampling event that will be conducted to support the next Five Year Review.	USACE / FES	Groundwater sampling will be conducted in spring 2015 following award of the contract option.
Operable Unit 2	2014 sampling identified PCE increases (above the remedial goal) which may be a result of the extremely high groundwater levels coming into contact with residual soil contaminants.	FES	The contaminant trend will be re-evaluated following the 2015 sampling event.
	Discussed sampling of DRMO1 and DRMO5 two-Party sites in 2015 to support the next Five Year Review. The water supply well could not be sampled in 2014 due to pump maintenance, but will be sampled in 2015.	USACE / FES	Groundwater sampling will be conducted in spring 2015 following award of the contract option.

Site / Topic	Discussion Items / Key Decision	Responsible Party	Follow-up Actions
Operable Unit 3 – Birch Hill Tank Farm	Discussed contaminant trends with focus on the potential for DCA migration. Noted that the only well (AP-6071) located along Lazelle Road (off-Post) was destroyed during a road upgrade by the City of Fairbanks. Discussed replacing this well and potentially installing additional well(s) along roadway to evaluate potential contaminant migration resulting from thawing permafrost.	RPMs	These issues will continue to be evaluated under the existing monitoring program; issues will be discussed at next FFA Meeting
	BHTF aboveground storage tanks (ASTs) are to be removed in Spring 2015. The “SIRI” contract includes an option to remove lead contaminated soil surrounding the tanks. Removal of AST 316 and associated lead contaminated soil would enable further investigation of the source of bedrock groundwater contamination.	RPMs	The Army will propose future investigation of the BHTF bedrock aquifer following removal of lead contaminated soil.
Operable Unit 3 – Railcar Offloading Facility	DRO increased in many of the ROLF wells in 2014, and at Valve Pit A benzene concentrations also increased; the increase was attributed to the high water levels.	FES	Contaminant trend will be further evaluated in 2015
	Replacement monitoring wells planned for 2014 could not be installed due to contract award/work plan approval coming late in the field season. Wells will be installed in Spring 2015 prior to the groundwater sampling event. Well installation methods and materials will be reviewed (including changing to schedule 80) to help prevent further well damage.	FES	A work plan addendum will be submitted in early spring to address any proposed changes in method or materials for well replacements throughout OU3
Operable Unit 3 – Milepost Sites	Discussed planned 2015 groundwater sampling event that will be conducted to support the next Five Year Review. The IC inspection identified wells that may need repair/replacement to allow groundwater sampling.	USACE / FES	Groundwater sampling will be conducted in fall 2015 following award of the contract option; wells will be evaluated for viability and repaired or replaced as necessary
Operable Unit 4 – Landfill	Landfill use is currently limited to disposal of fly-ash and ACM construction debris; the landfill is scheduled to be closed in 2020. Recommendations for reducing the Landfill sampling program that were approved in 2014 will be put into effect during the 2015 sampling effort, with the following two exceptions: o It is not possible to sample AP-6527 due to extremely slow recharge. This well will be removed from the sampling program o AP-10258, located near the Cat Shed, will continue to be sampled due to a detection of benzene above cleanup levels in 2014.	None	Previously approved by RPMs

Site / Topic	Discussion Items / Key Decision	Responsible Party	Follow-up Actions
Operable Unit 4 – Fire Training Pits	The fire training pit area is no longer the primary site being considered for the Org Parking Facility. However, during a 2014 site inspection, partially buried drums were identified. The drums were filled with soil and appeared to have been use for training. Discussed conducting groundwater sampling of existing wells in the FTP3A area to further evaluate PFOA/PFOS contamination identified by the 2013 investigation.	DPW / FES	An investigation will be conducted within the drum area to determine if potential contaminants are present. A groundwater sampling event will be conducted in spring 2015.
Operable Unit 5 – WQFS / EQFS	DRO and benzene concentrations were higher in many wells, possibly due to the high water levels. Spring sampling event at Sparge Curtain was not conducted in 2014, but semi-annual sampling is planned for 2015. Deployment of the Chena River Boom was limited to approximately one month due to extremely high river water levels. Building 1060 (EQFS Flowpath D) will be sampled in 2015 to support the next Five Year Review. Since the only remaining COC is DRO, this site may be transferred to the 2-Party program.	FES	Groundwater sampling and boom deployment will be conducted in Spring 2015 following award of the contract option.
Operable Unit 5 – BHTF ASTs	Discussed 2014 IC monitoring results of the BHTF fence. If lead contaminated soil is removed following the AST decommissioning, IC inspections of fence line might not be required.	FES	IC inspections of fence line will continue until RPMs determine it is no longer necessary (IC requirements for this site are discussed in the meeting minutes for Thursday, February 5th).
IC Inspections	Provided summary of 2014 IC inspections. Breaches at both the landfill and the BHTF fences occurred; however, no significant compliance issues were noted. No other IC issues were noted. A Post-Wide LUC/IC Management Plan will be written by an AEC contractor (Draft expected in Spring 2015)	DPW / AEC	These breaches will be included in the 2014 Annual IC Report.
Five Year Review	Discussed general plans for the five year review. “SIRI” sites will be mentioned in the 5YR EPA identified a “Streamlined Five Year Review” approach currently being used by the Navy; they are giving a presentation at the upcoming DSMOA meeting.	AEC / DPW EPA	The Army will contract and complete the Five Year Review EPA will provide the Army with a contact at the Navy to get information on the “Streamlined 5YR”
	Discussed whether the Five Year Review can be used to transfer sites from the Three Party program to the Two Party Program	EPA	EPA will investigate and provide some direction.

Site / Topic	Discussion Items / Key Decision	Responsible Party	Follow-up Actions
Wednesday, February 4th			
Neely Road	Discussed increases in EDB and DRO concentrations during 2014. ADEC requested that the treatment system be restarted for one year. Current contract allows for operation of the system.	USACE / FES	System will be restarted (air sparge only) after the spring 2015 groundwater sampling event.
Former Buildings 2111 / 2112	Discussed contaminant trends which indicate that the contaminant plume is stable. ADEC recommended the site be closed with institutional controls.	FES	The 2014 Monitoring Report will include a recommendation for "closure with institutional controls" with supporting information.
Two Party Sites	Presented monitoring results for the Bldg. 3564 site. Discussed several other sites that will be sampled in 2015, some of which may be closed with institutional controls.	DPW / ADEC	DPW and ADEC will discuss status of two party sites and whether additional sites may be closed with institutional controls.
FTW373 Organizational Parking Lot Well	Presented the decommissioning of the monitoring well (AP-7123) identified during construction of the FTW373 organizational parking lot. The project was shut down for the year, prior to completion. Discussed the need for a report of all the actions taken to deal with contaminated soils, etc. at the conclusion of the construction project.	DPW / USACE	The construction project is ongoing, and the report will be submitted once construction is complete.
Misc. Basewide Issues	RAB Solicitation	FES	Will be sent out to Project Team for review
	Dig Permit – EPA/ADEC requested that the dig permit on the Fort Wainwright website be updated to link the current version (May 2011 version is on the website which lists the incorrect phone number for DPW-Environmental).	DPW	DPW will have this corrected.
	"Pollution Sample Analyte Map Book" – ADEC/EPA requested copies	DPW	DPW will provide copies.

COMMENTS

REVIEW COMMENTS PROJECT: **Fort Wainwright**

DOCUMENT: **Draft 2015 Monitoring Report, OU-1, ADEC File No. 108.38.068.08**

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 3/21/2016** **REVIEWER: Dave Mayes** **PHONE:**	**Action taken on comment by: Karol Johnson**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1	Page 1-2, Paragraph 1.2.1(Fort Wainwright Landfill)	Reference to Fire Training Pit and Coal Storage Yard. The description of the operable unit should be part of the introduction.	A	Descriptions of the Fire Training Pit (FTP) and Coal Storage Yard (CSY) Sites were added to Section 1.	
1a		Did the Coal Storage Yard reach No Further Action or no monitoring requirements with Land Use Controls?	A	The CSY was recommended for NFA in the Second Five Year Review; however, to our knowledge follow up was not conducted for receiving the NFA (although, the NFA recommendation was acknowledged in a 2006 entry on the ADEC Contaminated Sites Database by Sharon Richmond). The Third Five Year Review lists the status of the CSY as "Remedial Action". There are ICs for the CSY, but no monitoring requirements. All references to the CSY as being NFA have been removed from the 2015 Landfill Monitoring Report.	
1b		The Fire Training Pit achieved No Further Action based on removal of the soils (was this documented in some type of after action report or completion report?). The statement on the construction can still be used.	A	The Decision Document for Fire Training Pits, Operable Unit 4, is included as Appendix A to the OU4 Record of Decision.	
2	Page 1-3, Paragraph 1.2.2 (Landfill CAT Shed - Building 1191)	What is the status of this facility or site?	A	The status of this site is listed as open in the ADEC database. Two wells found to contain benzene during the investigations at the Building 1191 Landfill CAT Shed site continue to be monitored as part of the long-term Landfill monitoring program. This site currently meets EPA's objective to ensure the injection well at issue is in compliance with the Safe Drinking Water Act Regulations (Section 7.3 of the Third Five Year Report, Fort Wainwright)	
2a		The EPA compliance order transferred this site to CERCLA with the monitoring requirements associated with Operable Unit 4. Was this site formally transferred (Technical Memorandum?) into Operable Unit 4?	A	In a letter from Mr. Joseph Malen dated 17 August 2011 to ADEC, Mr. Jacques Gusmano and Ms. Deb Caillouet, he states the following "In response to the US Environmental Protection Agency, Region 10 Underground Injection Control Program Consent Agreement and Final Order which includes the Landfill CAT Shed on Fort Wainwright, U.S. Army Garrison Fort Wainwright has committed to adding additional investigations related to the subject injection well to the normal Operable Unit 4	

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 3/21/2016** **REVIEWER: Dave Mayes** **PHONE:**	**Action taken on comment by: Karol Johnson**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)**	**CONTRACTOR RESPONSE**	**ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
				investigations currently in progress at the Fort Wainwright Landfill. Building 1191 is already a part of the Landfill Source Area so additional administrative actions are not necessary. Assistant Regional Counsel, Ankur Tohan's letter explicitly cites that "Any additional action, if necessary, to address contamination at the Landfill CAT Shed will be overseen by the CERCLA Program. Completion of these remaining actions will meet EPA's objectives to ensure the injection wells at issue in this enforcement action are in compliance with Safe Drinking Water Act Regulations." U.S. Army Garrison Fort Wainwright appreciates being afforded the opportunity to address these concerns under the CERCLA Program. According to the Certified Letter classified as "Enforcement Confidential" from the US EPA Region 10, Office of Regional Counsel, the Enforcement Action will be satisfied when the Landfill CAT Shed's UIC issue is incorporated/ documented within the Fort Wainwright FiveYear Review document currently being reviewed. The Army will direct its contractor to include the required language into the Operable Unit 4 and Summary sections of this document. A copy of the "Enforcement Confidential" letter will not be included in the Five Year Review due to its legal classification. This information is also mention in Section 7.3 of the Third Five Year Review.	
2b		Looking at the State of Alaska Contaminated Sites Data Base there appears to be three entries for this site: (1) Two under file number 108.26.040 (Hazard ID 2481 and 24458) that relate to the former storage tank but appear to be closed and (2) one under file number 108.38.070.040 (Hazard ID 25741) related to the dry well/UIC that is open. What is the requirement for the open site?			

REVIEW COMMENTS **PROJECT: Fort Wainwright**

DOCUMENT: Draft 2015 Monitoring Report, OU-1, ADEC File No. 108.38.068.08

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 3/21/2016** **REVIEWER: Dave Mayes** **PHONE:**	**Action taken on comment by: Karol Johnson**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
2c		The Third Five Year Review (2012) states the monitoring of three wells around Building 1191 will demonstrate compliance with the Safe Drinking Water Act. How was this changed to the contamination being associated with the landfill and the wells incorporated into monitoring the landfill? Was the Building 1191 area closed?	A	See response to comment 2a.	
3	Page 1-3, Paragraph 1.2.3 (Memorandum of Understanding).	a) In the referenced memorandum of understanding - did all three parties sign the agreement? Should this be referenced here? b) How was this incorporated into the Remedial Design/Remedial Action Documentation for monitored natural attenuation?	A	The Memorandum of Understanding (MOU) was signed by ADEC and the US Army. The MOU was referenced by request of ADEC. The MOU is discussed in Section 7, Operation and Maintenance Plan, of the Final Remedial Action Report, Operable Unit 4, Landfill, Fort Wainwright. A copy of the MOU is provided as Appendix D of the fore mentioned Report.	
4	Page 1-8, Table 1-3 (Crosswalk Table for OU4 Source Area Tracking Numbers).	a) The status for all the sites associated with operable unit 4 is recorded as "active" under the State of Alaska Contaminated Sites Database. b) The status of sites recorded in the State of Alaska Contaminated Sites Database does not appear to agree with decision made in the NPL/CERCLA program. What is being tracked by the State of Alaska?	A	The Site Status in Table 1-3 was changed to state that all OU4 sites are Active. A 1999 entry in the ADEC database by Rielle Markey for the FTP states that site closure was approved; however, the FTP site was reopened in 2015 By Debra Caillouet.	

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 3/21/2016** **REVIEWER: Dave Mayes** **PHONE:**	**Action taken on comment by: Karol Johnson**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)**	**CONTRACTOR RESPONSE**	**ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
5	Page 2-1, Table 2-1 (Monitoring Wells Sampled in at the Landfill in Spring and Fall 2015) and page 3-2, Paragraph 3.2.1 (Shallow, Intermediate, and Deep Monitoring Wells).	a) The purpose for the intermediate and deep monitoring wells is stated in paragraph 3.2.1. The purpose for the shallow monitoring wells is not given. b) If the reason for the types of wells applies to all constituent monitoring then the explanation of the different well depths could be moved to a different paragraph (than just associated with volatile Organic Compounds).	A	A statement identifying the purpose of the shallow wells was added and reference to the purpose of the deep and intermediate wells was moved to Section 3.2. The following is now the first paragraph in Section 3.2: Thirteen monitoring wells were sampled at the Landfill during April 2015: six shallow wells, three intermediate wells, and four deep wells. Six monitoring wells were sampled at the Landfill during November 2015: three shallow wells and three deep wells. Groundwater samples collected from wells using a 10 foot screen that is placed so that five feet of the screen is below the water table and five feet of screen is above the water table are designated as shallow wells. These wells are sampled to investigate contaminants that migrate along the surface of the water table. Intermediate wells are screened below the groundwater table and above permafrost and are sampled to investigate the vertical distribution of contaminants in the unconfined groundwater that flows above permafrost. Several wells are screened below permafrost (deep wells). These wells are sampled to monitor contaminants that are migrating in the aquifer below the permafrost. Benzene is the only compound that has migrated to downgradient deep wells at concentrations exceeding the RAG.	
6	Page 3-7, Paragraph 3.2.4.2 (PCA Degradation Products in Groundwater).	Reference to Figure 3-12 should probably be Figure 3-11.	A	The reference to Figure 3-12 was changed to Figure 3-11.	

REVIEW COMMENTS

PROJECT: Fort Wainwright

DOCUMENT: Draft 2015 Monitoring Report, OU-1, ADEC File No. 108.38.068.08

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 3/21/2016** **REVIEWER: Dave Mayes** **PHONE:**	**Action taken on comment by: Karol Johnson**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
7	General	Overall I would like some type of statement of the interpretation of all the results. a) It appears Benzene is only an issue below the frost line and the Benzene contamination is along the AP-6530, 6532, 5588, and FWLF-4 well line. b) Chlorinated solvents appear along the AP-5588, 8063, and 6535 well line, both above and below the frost line. Solvents do not appear in well AP-5589. c) There are two separate contamination flow paths away from the landfill.	A	The possibility of separate contaminate flow paths from the Landfill was discussed several years ago at an FFA meeting. At the time it was determined this was inconclusive because of the varying depths of the wells, the influence of the permafrost, and the lack of sufficient analysis from downgradient wells. There appears to be enough sampling data from wells AP-6530 and AP-6535 to reintroduce this idea. A statement will be included in Conclusion and Recommendations Section 5 that addresses the separate contaminant flow paths.	

REVIEW COMMENTS **PROJECT: OU4**

DOCUMENT: Preliminary Draft 2015 Annual Sampling Report **Location: Fort Wainwright, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 3-5-16** **REVIEWER: Benjamin** **PHONE: 907-753-5514**	**Action taken on comment by:** Karol Johnson and Vanessa Ritchie (FES)

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** **A - comment accepted** **W - comment withdrawn** **(if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
1.	SEDD 580-48876	Hold time for VOC is listed incorrectly as 15 days, while it is actually 12. I think it is because of two extraction dates, but the first was reported as primary, so the first hold time should be reported.	A	The hold time for VOC will be corrected to 12 days in the SEDD, as indicated.	
2.	Lab 54924, 55009	It has been a long time since I have seen so many failure for LCS and LCSD. What is up with Test America? No need to answer.	Noted	Good question… The project laboratory was changed to ALS for 2016 due to the large number QC issues experienced with Test America. So hopefully we'll see fewer LCS/LCSD issues in upcoming sampling events.	
3.	Figure 3-3, 3-10, 3-11	I don't see any associated data flags along with presented data.	Noted	For clarity, data flags are not included on Figures. However, a note will be added to the legend directing the reader to the Tables where data flags can be found.	
4.		----- End of Comments ----			
5.					
6.					
7.					

REVIEW COMMENTS **PROJECT: OU4**
DOCUMENT: ~~Preliminary~~ Draft 2015 Annual Sampling Report **Location: Fort Wainwright, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1	12 1.2.1	Please clarify the sentence describing the Coal Storage Area. "The Coal Storage Yard was recommended for No Further Action (NFA) in the Second Five Year Review; however, it is still listed as an active site." If IC inspections are required at the CSA, then it should not be considered NFA.	A	There is no conflict with the statements in the report. The report does not state that the site was NFA'd, only that it was recommended for NFA, which is confirmed by the ADEC contaminated sites database.	A
2	12-14 1.2.2	The discussion on results from the Fire Training Pits are based on work that was not reviewed or approved by the regulators. The section should be rewritten to describe the sampling that was conducted under 'mission critical' authority without regulator input and delete the interpretation of the results.	A	The interpretation of the results will be deleted and this section will be updated to be more concise in its summary and the FTP Report will be referenced. Additional comments concerning the FTP will be addressed with the FTP Report.	A
3	13 1.2.2.	"A Decision Document for soil removal at the Fire Training Pits area (U.S. Army, No date) was included in appendix to the OU-4 ROD". Please elaborate on where the OU4 FTA removal action contaminated soils were disposed? The landfill? ADEC database from 11/4/1999 notes that the removal action has been completed but no post-removal action report is referenced or available for review.	A	The 1996 excavation at the Fire Training Pits was documented in the report, "Site Assessment Report – Remove Soil at Burn Pits, Fort Wainwright – January 1997". The report describes excavation, stockpiling, transportation, treatment, and disposal of contaminated soil. The target of the excavation was petroleum contaminated soils, and the soils were transported to and treated by OIT in Moose Creek, AK. The treated soil was transported back to Fort Wainwright where it was used at the active landfill as capping material. This section will be updated to be more concise in its summary and the FTP Report will be referenced. Additional comments	A – please include the text from the response in the report.

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
				concerning the FTP will be addressed with the FTP Report.	
4	13 1.2.2.	" While the RI and the subsequent removal action successfully addressed Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements for the FTP sites, concern remained that soil contamination could be encountered during planned construction projects at these sites." The subsequent removal was not done under CERCLA if this site was determined to be NFA in the OU4 ROD. Please modify the sentence to disassociate the removal action under CERLCA authority.	A	The removal was done under CERCLA. The following is from the Decision Document included into the OU4 ROD: "This decision document describes the removal action for the Fire Training Pits (FTPs) 3A and 3B Source Area, Operable Unit 4, at Fort Wainwright. This removal action has been chosen in accordance with Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) as amended by Superfund Amendment Reauthorization Act (SARA), the National Contingency Plan (NCP), Resource Conservation and Recovery Act (RCRA), and Army Regulation 200-1, as applicable."	A
5	13 1.2.2	Consider rewriting the following sentence to clarify how the investigation was conducted: Geophysical surveys and soil and groundwater investigations were conducted in 2013 without regulator review or approval. Delete the remainder of the results discussion around the 2013 and 2015 sampling efforts.	Noted and A	The investigation was approved by ADEC. The results discussion around the 2013 and 2015 sampling efforts will be deleted. This section will be updated to be more concise in its summary and the FTP Report will be referenced. Additional comments concerning the FTP will be addressed with the FTP Report.	A
6	15 1.2.4	Consider clarifying the well AP-6137 is now the well designated as AP-8061. This is the most downgradient,	A and Noted	Clarification is provided under the Section titled "Replaced Wells AP-6137 and AP-	noted

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		shallow well that is monitored yet concentrations still exceed RAGS for benzene and TCE. What about a recommendation to install a shallow well downgradient of AP-8061 to the southwest if that is the understood direction of flow of the shallow aquifer? Without it, the downgradient shallow aquifer plume boundary is undefined. (what is the status of shallow wells AP6139 and AP-5997? Perhaps a new shallow well is needed to the west of AP-5997?)		6139”. Additional clarification was included in the first paragraph of Section 1.2.4. Installing a new shallow monitoring well downgradient of AP-8061 was discussed in 2011. However, it was agreed by all RPMS that existing monitoring well AP-5997, located adjacent to the Chena River, would be sampled instead of installing a new well. AP-5997 was sampled in the spring of 2011 to determine if contaminants have migrated downgradient of AP-8061. With the exception of bis-(2-Ethylhexyl)phthalate that was detected well below the cleanup level, no other COC were detected in this well; therefore, it was agreed that no additional sampling would be conducted at this well. AP-6139 was replaced by well AP-8062 and then again by AP-9076 due to severe frost jacking in this area. It was ultimately determined that the wells in this area were installed in perched groundwater (on permafrost) and were not connected to the groundwater flow from the Landfill source area. These wells are recommended for decommissioning. AP-5997 is a viable well for sampling. Installing additional shallow wells west or	

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				southwest of AP-8061 is not possible due to the presence of permafrost.	
7	17 1.2.4 AP-6132	" a permafrost evaluation conducted in 2010 identified a massive block of permafrost between this well and the Landfill (shown on Figure 3-1)". Are there estimates on the thickness and depth of the permafrost block? If the permafrost block is a critical component influencing plume mobility, are there any repeated measures to see how the permafrost may be shifting in dimension over time?	Noted	Information presented during the February 2011 FFA meeting, based on CRREL's permafrost delineation and modeling, indicated the following: that a thaw bulb is assumed present beneath the landfill, permafrost is discontinuous east of the landfill, west of the landfill there is thick continuous permafrost, and south of the landfill, permafrost is highly variable. Specific estimates on thickness and depth were not provided. However, the presence of permafrost between AP-6132 and the Landfill makes this well unreliable as an upgradient well.	A – appears to be a data gap in delineating plume mobility
8	22 2.1	There must be some pre-sampling activities to monitor for methane gas prior to any disturbance activities in the well or in the vicinity as a health and safety precaution.	Noted	All groundwater monitoring wells are several hundred feet away from landfill buried debris areas and are unlikely to contain significant concentrations of methane.	A
9	29 3.2	"Groundwater samples collected from wells using a screen that is placed so that at least five feet of the screen is below the water table and five feet of screen is above the water table are designated as shallow wells. These wells are sampled to investigate contaminants that migrate along the surface of the water table." Please provide rationale on how this screen placement may affect sampling and associated concentrations of	Noted	The screened intervals were described in the Report to clarify the difference between "shallow", "intermediate", and "deep" wells, as the wells are frequently discussed within these categories. However, the lengths and depths of screened intervals were ultimately based on subsurface conditions (i.e., location of	Noted

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

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		contaminants that do not migrate at the water table surface, such as chlorinated solvents.		permafrost, and location of groundwater). Intermediate wells (wells screened below the water table) were placed in the most likely pathways for contaminants that do not migrate at the water table surface.	
10	29 3.2	"Benzene is the only compound that has migrated to downgradient deep wells at concentrations exceeding the RAG." Deep well AP-6532 shows bis(2-ethylhexyl)phthalate above cleanup levels in both April and Nov 2015. Is it coming from the upgradient shallow well FWLF-4?	A	This is an incorrect statement and it will be removed from the Report. It is expected that Bis(2-ethylhexyl)phthalate (DEHP) at OU4 is migrating from the landfill; however, the specific source is unknown. DEHP is common in the environment because of its use in plastics. Sampling and laboratory equipment, monitoring wells, and waste disposed in landfills may contain or be constructed of plastics. DEHP is also used in inks, adhesives, coatings, pesticides, cosmetics, vacuum pump oil and as a dielectric fluid in ballast capacitors and other electrical equipment (e.g., transformers). It has low solubility in water (300 - 400 µg/L), is soluble in most organic solvents, and evaporates slowly into the air. It has not been shown to degrade in anaerobic conditions, such as landfill leachate.	A
11	30 3.2.1	" Monitoring well AP-8061 was installed in the same location and to the same depth and screen interval as well AP-6137; therefore, the data from these wells were combined for data analysis."	Noted	This will be considered for the 2016 Monitoring Report.	A

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		For trend analysis, even if the wells are in the same location and same depth and screen interval, it is recommended to only analyze data generated from a specific well. There are plenty of data points (minimum of 8 needed) to statistically determine trends on replacement well AP-8061 only.			
12	30 3.2.1 Shallow monitoring wells	It is very difficult to discern any influence of seasonality or groundwater level using this graphical format. If possible, please graph groundwater elevations in addition to contaminant concentration. It would be helpful to provide an additional graph for individual wells that displays all the chlorinated solvent concentrations over time to see the patterns for dechlorination of the parent to daughter products.	A and Noted	Where possible, groundwater levels will be included on the graphs. Additional graphs for individual wells that display all the chlorinated solvent concentrations over time will be considered for the 2016 OU4 Monitoring Report.	A
13	30 3.2.1 Well AP-8061	Suggest that the data for AP-8061 exclude data from well AP-6137 (Jul 1997 to September 2001?) Explore putting another shallow downgradient well beyond the permafrost block or to the SW. The shallow aquifer plume has not been delineated.	A and Noted	The graphs for AP-8061 will exclude data from AP-6137. Installing additional downgradient shallow wells has been explored by the RPMs and it has been determined that it is not possible to install a shallow well to the SW due to permafrost. A downgradient shallow well "beyond the permafrost block" is not expected to provide pertinent data for plume migration in the shallow aquifer as historical data indicates the contaminant plume is "diving" beneath the permafrost downgradient of the landfill. However, well AP-6061 is a shallow well located southwest of the landfill, beyond the permafrost block, that	A

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
				can be sampled if RPMs favor pursuing this.	
14	30 3.2.1 Well AP-10257	Please correct the discrepancies between the data on Figure 3-3 and the summary in this narrative. "Benzene has been above the RAG in well AP-10257 during each sampling event, with the exception of June 2013, ranging from 6.6 µg/L in fall 2014 to 17 µg/L in fall 2013. Bis(2-ethylhexyl phthalate) was also detected above the RAG in AP-10257 in 2015 for the first time since sampling began at this well" Table 3-2 reports a value of ND(2.1) for the primary sample and 14 ug/L for the duplicate. Should the duplicate be reported on the Figure?	A	The discrepancies will be corrected. The benzene result was rounded up from 6.6 to 7.0 – it will be changed to 6.6 on the Figure, and the duplicate result of 14 will be used for DEHP.	A
15	31 Intermediate Monitoring Wells	Would statistical analysis support the statement of increasing trends for TCE in well AP-5589?	A	Statistical analysis at AP-5589 will be reviewed for the 2016 Monitoring Report.	a
16	31 3.2.1 AP-6532	For future reports, ADEC 2,6-DNT GW cleanup level 1.3 ug/L (2008); drops to 0.49 ug/L with 2016 regs. Do any other wells may exceed this cleanup value?	Noted	The cleanup level will be modified accordingly in the 2016 Report. 2,6,-DNT was not detected in any other well.	A
17	32 3.2.1 Contaminant flow paths Benzene	Appreciate the CSM for permafrost at this location. It doesn't track well that the upgradient shallow aquifer is the source of the benzene in the deep aquifer contaminants when the upgradient wells have always been below RAGs. Typically dilution is the solution to pollution.	Noted	AP-5588 and AP-8061 are the two shallow wells nearest the downgradient edge of the landfill. While AP-5588 consistently has benzene concentrations slightly below the RAG, benzene has been commonly detected above the RAG in AP-8061. Being more mobile than most landfill contaminants, it is possible that benzene has migrated away from the upgradient area (immediately downgradient of the landfill).	Noted

REVIEW COMMENTS **PROJECT: OU4**
DOCUMENT: ~~Preliminary~~ Draft 2015 Annual Sampling Report **Location: Fort Wainwright, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
18	32 3.2.1 AP-6530 AP-6534	3 benzene exceedances out of 9 sampling events doesn't really match the description of consistently detected above the RAG for well AP-6530 It would be helpful to add well AP-6534 to Fig 3-10 plan view since it is discussed in the narrative and seems to lie in between AP-6535 and AP-6138	Noted and A	The report does not state that that benzene consistently exceeds the RAG in AP-6530. Well AP-6534 will be added to the plan view on Figure 3-10.	D- Check the paragraph on Contaminant Flow paths, p. 3-5 *The word consistently was removed from the report*
19	32 3.2.1 Contaminant flow paths Chlorinated Solvents	Is there additional explanation for the disconnect between the April 2015 concentrations in wells AP-5588 and AP-8063, with the shallow well with exceedances for chlorinated solvents orders of magnitude over cleanup levels and non detects or an order of magnitude below CL in the deep well AP-8063.	Noted	There is no good explanation for the anomalous results in AP-8063. Unfortunately, this was the first year that the sampling frequency was reduced to annually in this well. This well will return to biannual sampling in 2016 due to this anomalous result.	A
20	35 Graph 3-1	This is an interesting representation of the chlorinated VOCs degradation. With similar slope/trend lines across the two sampling events, does this suggest there is only one source area for the parent compound?	A	Identifying the specific sources of a chlorinated hydrocarbon plume can present a complicated problem at a landfill. However, it is safe to assume that the closed portion of the OU4 landfill is providing a source of dissolved chlorinated compounds leaching to groundwater.	A
21	Figure 3-3	It would be helpful to 'color' monitoring wells with exceedances. When this is done, the westerly pattern from shallow to deep is more apparent. AP-8062 discussed in the narrative but not shown on the	Noted	The current format of this Figure is consistent with many years of historical Reports for this OU. AP-8062 replaced AP-6139 and then was replaced by AP-9076. Well AP-8062/AP-	A- Consider for future reports

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		map. Please include its location on the map.		9076 is not sampled; however, it is currently indicated on Figure 3-3 in gray scale.	
22	Graphs 3-4 to 3-9	This comment applies to all graphs and the trend discussions in the narrative. Plenty of data now to do some statistical trend analysis. The narrative describes increasing or decreasing trends but that's a difficult call given the stochastic behavior of the data on some wells. This comment applies to all the concentration vs time graphs. The graphical representation of concentration over time is difficult to pull out patterns and understand if the variability is due to seasonal groundwater elevation. What is the pattern for spring samples for an individual COC over time? Verses the trend of the same COC sampled in the fall? For the chlorinated VOC wells, one additional graph per well with all PCA and daughter products would be illustrative of the changes in concentration due to degradation of the parent compound.	Noted	These graphs will be considered for the 2016 Monitoring Report. Incorporation of the requested data into future monitoring reports can be discussed during the 2017 winter FFA meeting.	A
23	Figure 3-10 and 3-11	These CSM figures are very illustrative and well done. How is the permafrost block changing over time and affecting plume migration? If we don’t have a means to measure that on intermittent intervals, it should be considered.	Noted	Currently the change in the permafrost block over time is not measured. This suggestion will be presented to the RPMs.	A
24	53 5.0 AP-5588	The sample frequency at this well was reduced to annual spring sampling in 2015 because historically COC concentrations have not varied significantly between the spring and fall sampling events. It would be very helpful to plot the concentrations of spring only, and a separate of fall only, before making these	Noted	Reducing the sampling frequency of AP-5588 was approved in the 2014 OU4 Monitoring Report.	Noted

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		conclusions as the time series graphs are difficult to pull out these patterns.			
25	56 Table 5-1	Given the number of contaminants above RAGs and the variability of the data, suggest well AP-5588 be sampled biannually.	Noted	See response to comment 24.	noted
26	5.0	For future sampling to assess emerging contaminants, add in 1,4-dioxane and PFAS compounds (landfills are a significant source of PFAS, and the soil removal of the fire training pits disposed of potentially PFAS contaminated soils on the landfill as cover).	Noted	For future sampling to assess emerging contaminants, in 1,4-dioxane and PFAS, will be discussed with the RPMS.	A
Minor Comments					
27	13	Typo *: 2619* in the sentence "hydrocarbons in surface and shallow subsurface soils would 2619 protect human health and the environment from potential risks."	A	The number was removed.	A
28	Figure 2-1	The legend states the wells are from 2012. It is assumed this should be updated to 2015	A	The date will be updated to 2015.	A
29	31 Also on page 55 Deep monitoring wells	because of the anomalous results, the sampling frequency will return to biennial in 2016. Biennial means every two years. Biannual means twice a year. It is assumed this should be changed to reflect sampling biannually - twice a year (spring and fall).	A	The text was updated to say biannually on pages 3-4 and 5-3.	A
30	3.2.2 SVOCs	In addition to plastic, bis-(2-eh)pthalate is also found in hydraulic fluid and dielectric fluid in capacitors, all of which could have been discarded in a landfill	A	Additional information about DEHP will be added to this section, See comment#10.	A
31	55 5.0	Typo: AP-6532, AP-6530, and– Also missing a period in this sentence "but was below the RAG in farther down gradient well AP-6530 in 2015. Wells AP-6532 and AP-6530 will continue to…"	A	The text was corrected to say: AP-6532 and AP-6530	A

REVIEW COMMENTS **PROJECT: OU4**
DOCUMENT: ~~Preliminary~~ Draft 2015 Annual Sampling Report **Location: Fort Wainwright, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/21/2016** **REVIEWER: EPA** **PHONE:**	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
32	124 Appendix B 2.1	Typo: product, not project in the sentence "No free project was measured."	A	The text was corrected to say "free product"	A

THE STATE
of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation

DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites Program

610 University Ave.
Fairbanks, Alaska 99709-3643
Main: 907.451.2180
Fax: 907.451.5105

File: 108.38.070.03

April 29, 2016

Dept. of the Army
Directorate of Public Works
Attn: IMPC-FWA-PWE (Malen)
1060 Gaffney Rd, #4500
Fort Wainwright, Alaska 99703-4500

Re: Draft 2015 Annual Sampling Report, Groundwater Monitoring and Data Analysis at the Landfill Source Area, Operable Unit 4 FTWW-038, Fort Wainwright, Alaska

Dear Mr. Malen:

The Alaska Department of Environmental Conservation (DEC) has completed a review of the above referenced report. Comments are enclosed.

If you have any questions, please do not hesitate to contact me at (907) 451-2180, or by email at dennis.shepard@alaska.gov.

Sincerely,

Dennis Shepard
Environmental Program Specialist

Enclosure: DEC_comments_OU4Landfill_2015_MonitoringReport

cc: Sandra Halstead, EPA, via e-mail
Kristina Schlosbon, FWA ENVR, via email
Brian Adams, FWA ENVR, via email
Bob Hazlett, USACE, via e-mail
Bob Brock, USACE, via email
Robert Glascott, USACE, via email
Cheryl Churchman, AEC, via email
Eric Breitenberger, DEC, via email
Kim DeRuyter, DEC, via email

REVIEW COMMENTS

PROJECT: Fort Wainwright

DOCUMENT: 2015 ANNUAL SAMPLING REPORT: Groundwater Monitoring and Data Analysis at the Landfill Source Area

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 5/19/2016** **REVIEWER: J. Whitsel / D. Shepard** **PHONE: 907-451-2180**	**Action taken on comment by: Karol Johnson, Fairbanks Environmental Services**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	CONTRACTOR RESPONSE
1	Sec. 2.3	Hot water was introduced to well AP-6532 to thaw it. Sampling log (p. 61) does not indicate use of hot water or extra purging of water, but it was indicated in field notebook.	A	The Groundwater Sampling Form will be updated to reflect the use of the hotsie to thaw well AP-6532 and description of the use of the hotsie as well as the additional purging required will be added to the Report.		
2	P. 5-3	The text recommends that well AP-8063 return to biennial sampling frequency. If the intention is to sample twice a year, the correct term is semi-annual. Biennial is every 2 years.	A	The text will be changed to state semi-annual instead of biennial.		
3	Fig 3-3	Please indicate on Figure 3-3 the location of the containment cell containing pesticide-contaminated soil from OU-1. Please include on other maps as appropriate.	A	The figures will be updated as requested.		
4	Table 5-1	DEC concurs with the recommendations for monitoring well sampling and de-activation as indicated in Table 5-1.	Noted			
5		- End of comments -				

COVER LETTERS

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
DIRECTORATE OF PUBLIC WORKS
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

January 13, 2017

Directorate of Public Works

Subject: Submission of FINAL 2015 ANNUAL SAMPLING REPORT, Groundwater Monitoring and Data Analysis at the Landfill Source Area, Operable Unit 4, Fort Wainwright, Alaska, to Environmental Protection Agency.

Ms. Sandra Halstead
Environmental Protection Agency
Federal Facilities Superfund Site Manager
Alaska Operations Office
222 W. 7th Ave, #19
Anchorage, AK 99513

Dear Ms. Halstead:

Enclosed with this letter is the Final 2015 Annual Sampling Report, Groundwater Monitoring and Data Analysis at the Landfill Source Area, Operable Unit 4 (OU4), on Fort Wainwright, Alaska. The report includes a paper copy along with a CD containing a pdf of the report and laboratory deliverables. A copy of this document is being provided to Mr. Dennis Shepard, Environmental Program Manager, Alaska Department of Environmental Conservation.

If you have questions or concerns regarding this action please contact the undersigned at, (907) 361-6623 or email brian.m.adams18.civ@mail.mil or you may contact Mr. Joseph S. Malen, Directorate of Public Works, Remedial Project Manager (907) 361-4512 or email joseph.s.malen.civ@mail.mil.

Brian M Adams
Brian M. Adams
Remedial Project Manager, Restoration Branch

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
DIRECTORATE OF PUBLIC WORKS
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

January 13, 2017

Directorate of Public Works

Subject: Submission of FINAL 2015 ANNUAL SAMPLING REPORT, Groundwater Monitoring and Data Analysis at the Landfill Source Area, Operable Unit 4, Fort Wainwright, Alaska, to State of Alaska Department Environmental Conservation.

Mr. Dennis Shepard
Alaska Department of Environmental Conservation
Environmental Program Manager
610 University Avenue
Fairbanks, AK 99709

Dear Mr. Shepard:

Enclosed with this letter is the Final 2015 Annual Sampling Report, Groundwater Monitoring and Data Analysis at the Landfill Source Area, Operable Unit 4 (OU4), on Fort Wainwright, Alaska. The report includes a paper copy along with a CD containing a pdf of the report and laboratory deliverables. A copy of this document is being provided to Ms. Sandra Halstead, Federal Facilities Superfund Site Manager, Environmental Protection Agency.

If you have questions or concerns regarding this action please contact the undersigned at, (907) 361-4512 or email brian.m.adams18.civ@mail.mil or you may contact Mr. Joseph S. Malen, Directorate of Public Works, Restoration Project Manager (907) 361-4512 or email joseph.s.malen.civ@mail.mil .

Brian M Adams

Brian M. Adams
Remedial Project Manager, Restoration Branch