Final 2016
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-16-D-0005
Task Order 3

November 2017

FES
FAIRBANKS ENVIRONMENTAL SERVICES INC.

FINAL 2016
ANNUAL SAMPLING REPORT

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Operable Unit 4
Fort Wainwright, Alaska

November 2017

Prepared for

U.S. Army Corps of Engineers, Alaska District

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Contract W911KB-16-D-0005

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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
AS/SVE	air sparge/soil vapor extraction
AWQS	Alaska Water Quality Standards
bgs	below ground surface
°C	degrees Celsius
CAT	Caterpillar
CDQR	Chemical Data Quality Review
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-Dichloroethene
CRREL	Cold Regions Research and Engineering Laboratory
COCs	contaminants of concern
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
IDs	identification numbers
IDW	investigation-derived waste
Landfill	Fort Wainwright Landfill
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LL	low level
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
OIT	Organic Incineration Technology, Inc.
OU4	Operable Unit 4
ORP	oxidation/reduction potential

LIST OF ACRONYMS AND ABBREVIATIONS

PCA	1,1,2,2-tetrachloroethane
PCE	tetrachloroethene
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
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 (COCs) 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 2016 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 10 wells during July 2016 and seven wells during October 2016 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, COCs were detected above RAGs in five out of seven wells: shallow wells AP-5588 and AP-8061, intermediate well AP-5589, and deep wells AP-6532 and AP-8063. COCs were also detected above RAGS in two of three wells located upgradient of the closed portion of the Landfill: AP-10257 and AP-10258. The following compounds were detected above RAGs:

Downgradient Wells

- AP-5588 – cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,2,2-tetrachloroethane (PCA), 1,1,2-trichloroethane, and trichloroethene (TCE)
- AP-5589 – PCA and TCE
- AP-6532 – benzene and bis(2-ethylhexyl)phthalate
- AP-8063 – cis-1,2,-DCE, PCA, and TCE

Upgradient Wells

- AP-10257 – benzene
- AP-10258 – benzene

Although no RAG exists for nickel, it was also detected above the ADEC groundwater cleanup level in well AP-10258. Arsenic was detected in two wells downgradient of the Landfill above the

ADEC groundwater cleanup level, but is believed to be a consequence of natural mineral deposits.

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 source 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 September 2016. The Landfill cap and fence were observed to be in good condition. All groundwater monitoring wells sampled to evaluate site contaminants were found to be in good condition.

Recommendations for 2017 include sampling three wells in the spring only, AP-5588, AP-5589, and FWLF-4, and sampling seven wells in the spring and fall 2017, AP-8061, AP-10257, AP-10258, AP-8063, AP-6530, AP-6532, and AP-6535. An IC inspection of the Landfill cap and monitoring wells should be conducted in 2017.

1.0 INTRODUCTION

This report documents long-term groundwater monitoring activities conducted during 2016 at the Fort Wainwright Landfill (Landfill), Fort Wainwright, Alaska. It also describes the 2016 institutional controls (ICs) 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, 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. The other OU4 sites, Coal Storage and Fire Training Pits, are discussed briefly as part of the OU4 background: however, activities at these sites are not addressed further in this Report. 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 2016 Operable Unit Work Plan (FES, 2016a) and the Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2016b). 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 2016 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, Sampling, and Analytical Program
- Section 3 – Groundwater Sample Results
- 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 – MAROS Results

- Appendix E – Photographic Log
- Appendix F – FFA Meeting Key Decisions

1.2 Background

U.S. Army Garrison Fort Wainwright is an active U.S. Army facility, located on the eastern edge of Fairbanks, Alaska. OU4 consists of three source areas on Fort Wainwright: 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 Fort Wainwright. 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 beneath the site was contaminated by petroleum hydrocarbons, chlorinated solvents, and bis(2-ethylhexyl)phthalate.

The remedy consisted of operating an air sparge/soil vapor extraction (AS/SVE) treatment 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 CSY 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 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. 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 OU4 ROD (USARAK, 1996).

The 1996 excavation at the FTPs 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. After the petroleum contaminated soil was excavated, it was transported to and thermally treated by Organic Incineration Technology, Inc. (OIT) in Moose Creek, Alaska. 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, including contaminants that were not analyzed for during previous investigations, could be encountered during planned construction projects at these sites. 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. Groundwater results were below ADEC cleanup levels and 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/cleanup levels. Results of investigations at the Former Fire Training Pits are discussed further in a separate report (FES, 2017) 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 (west and southwest) of the capped area.

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 by the ADEC Solid Waste Program through 2020.

A Remedial Investigation (RI) was completed at the site in 1994. COCs identified in groundwater include benzene, several chlorinated compounds, bis(2-ethylhexyl)phthalate, 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 buried 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. A bentonite slurry 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 above the RAG. 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 Title 40 of the Code of Federal Regulations Part 258 (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 (replacement well for AP-6137) and AP-8063, are also sampled as part of the monitoring program. Downgradient deep monitoring wells AP-6530 and AP-6535 and shallow wells AP-10257, AP-10258, and AP-10259 (associated with the Building 1191 leach field) were also added to the monitoring program. In 2016, 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.

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 in 2016 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 in 2016 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. AP-6139 and its replacement wells were removed from the monitoring network in 2008 due to groundwater anomalies and frost jacking.
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 in 2010 to monitor downgradient migration of benzene in the subpermafrost aquifer.
	AP-10257, AP-10258, AP-10259	Added to the monitoring network in 2012 to monitor upgradient benzene concentrations associated with the Building 1191 leach field. Well AP-10259 was removed from the monitoring network in 2016 due to absence of COC above RAGs since it was installed.

<u>Dry Wells AP-6130 and AP-6140</u>

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), which was subsequently damaged and replaced with well AP-9076 in 2004. Well AP-8061 continues to be sampled as part of the groundwater monitoring program for the Landfill. 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-8063 (also named AP-6139B), was installed in 2002 to delineate downgradient migration of contaminants below permafrost. Well 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 below permafrost to 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-ethylllllhexyl)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 above cleanup levels over time, these three wells were removed from the monitoring network following the spring 2015 sampling event.

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- DCE, 1,1,2-trichloroethane, vinyl chloride, trichloroethene (TCE), and bis(2-ethylhexyl)phthalate. Since there were no federal or state MCLs for 1,1,2,2-tetrachloroethane

(PCA) during the signing of the ROD, 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** **micrograms per liter (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

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 identification numbers (IDs) are summarized in Table 1-3.

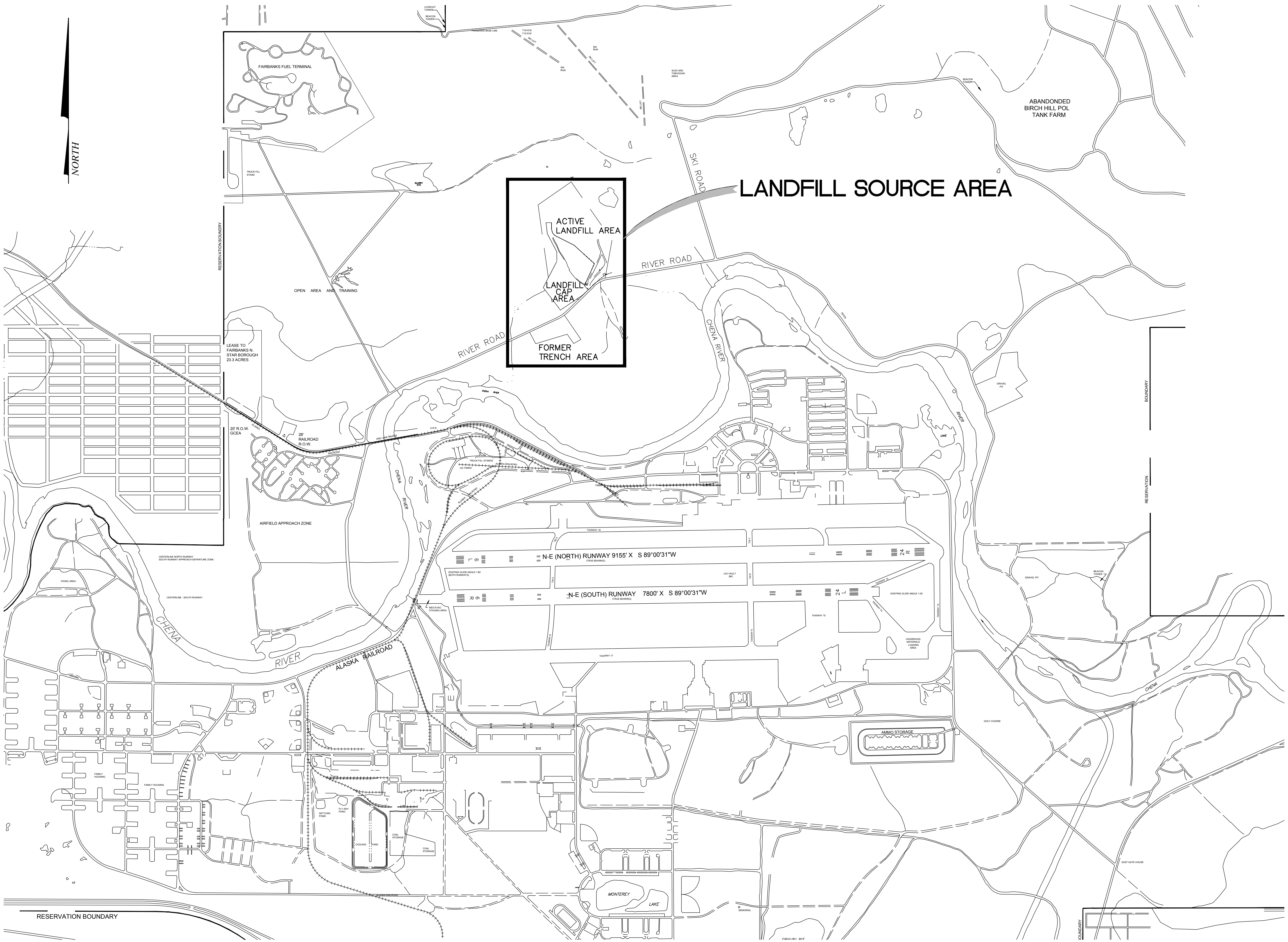
Table 1-3. Crosswalk Table for OU4 Source Area Tracking Numbers[1]

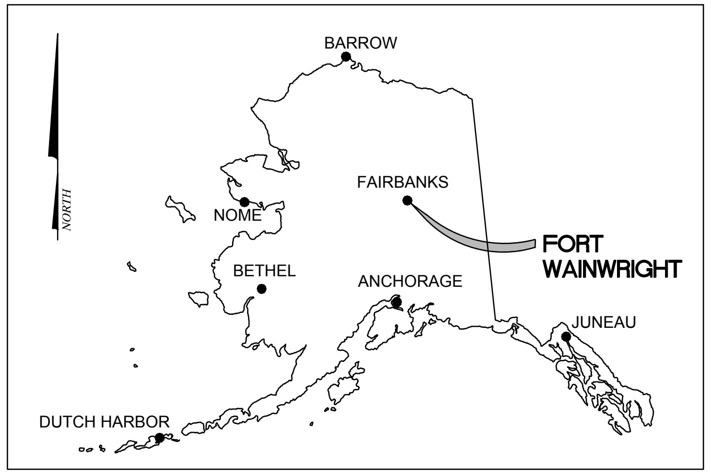
OU4 Source Area	**AEDB-R Number**	**ADEC File ID**	**ADEC Hazard ID**	**Site Status[2]**
Landfill Plume	FTWW-038	108.38.070.03	1129	Active
Fire Training Area	FTWW-037	108.38.070.02	1419	Active
Coal Storage Yard	FTWW-011	108.38.070	2342	Active
Landfill Garage Building 1191[3]		108.38.070.04	25741	Active

[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 site.





LOCATION MAP

0 1000 2000 4000
SCALE IN FEET

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Site Vicinity and Location Map
Landfill Source Area

2016 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-16-D-0005	FIGURE: 1-1	DATE: 11/17

2.0 GROUNDWATER MONITORING, SAMPLING, AND ANALYTICAL PROGRAM

Field activities were completed at OU4 in 2016 according to the 2016 Operable Unit Work Plan (FES, 2016a) and the Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2016b). Groundwater sampling was conducted in July and October 2016. 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.

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 10 monitoring wells were sampled at the Landfill during July 2016. Seven of the ten monitoring wells were sampled again during October 2016. 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 2016

Well	Depth	Location
AP-5588[1]	Shallow	Downgradient (west) of capped Landfill
AP-8061[1]		
AP-5589	Intermediate	
AP-6530	Deep	
AP-6535		
AP-8063		
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

[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, 2016b). The low-flow sampling method utilized submersible pumps in all but two wells where a submersible pump would not fit down the well casing. At wells AP-5588 and AP-8063, a variable speed peristaltic pump equipped with dedicated Teflon-lined tubing was used to purge and sample the wells. Wells were sampled by placing sample tubing 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, 2016a). 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 2016.

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. All project and quality control samples were analyzed by ALS Environmental (ALS) of Kelso, Washington except for methane samples; methane samples were subcontracted to ALS of Simi Valley, California for analysis. An evaluation of data quality is detailed in a Chemical Data Qualify Review (CDQR) and ADEC Laboratory Data Review Checklists. The CDQR and ADEC Checklists 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-LL (SVOCs – low level)
- EPA Method 6020A (Total Metals)
- Method RSK-175 (Methane)
- EPA Method 6010C (Iron, field filtered)
- 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. As such, deep monitoring wells AP-6530, AP-6535, AP-6532, and AP-8063 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 in the well casing 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 and thickness of the ice in the well casing.

2.4 Decontamination

Reusable sampling equipment consisted of a water level meter, 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. Following groundwater sampling, the submersible pumps were decontaminated in accordance with the UFP-QAPP (FES, 2016b).

2.5 Investigation Derived Waste Disposal

Investigation-derived waste (IDW) generated during OU4 field activities in 2016 included purge water, decontamination water, and miscellaneous non-hazardous solid waste (nitrile gloves, paper towels, etc.) from groundwater sampling activities. All IDW was managed according to the procedures outlined in the 2016 Operable Unit Sites Work Plan (FES, 2016a).

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.

The purge water from the OU4 Landfill site was disposed of as CERCLA waste. The drums of purge water were provided to Environmental Compliance Consultants (ECC – the Fort Wainwright waste disposal contractor) at the completion of the sampling activities. Complete documentation of the CERCLA waste disposal will be provided in the 2016 IDW Technical Memorandum (anticipated in spring 2017).

The decontamination water generated during groundwater sampling was containerized and treated using granular activated carbon (GAC). The treated water was discharged on the OU4 Landfill site, at a location that was vegetated and at least 100 feet from any surface water body source. The discharge location is shown on Figure 2-1.

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
	16FWOU404WG	7/11/2016	1400	15.90	0	7.07	0.722	0.99	6.44	-21.7	7.82	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
	16FWOU411WG	7/12/2016	1720	14.87	0	2.57	1.250	0.56	5.80	-35.4	12.62	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
	16FWOU408WG	7/12/2016	1350	15.85	0	3.67	0.915	0.66	6.63	-55.0	2.51	y
	15FWOU417WG	10/18/2016	1015	16.00	0	1.03	0.977	0.62	6.21	6.1	1.94	Y
AP-8061	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
	16FWOU405WG	7/11/2016	1700	7.87	0	1.78	0.690	0.30	6.23	-64.9	36.54	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
	16FWOU406WG	7/12/2016	1145	14.13	0	3.28	0.471	0.55	6.25	-62.7	5.92	Y
	16FWOU416WG	10/17/2016	1545	14.53	0	1.48	0.477	0.28	6	-24.2	4.91	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
	16FWOU410WG	7/12/2016	1600	14.98	0	1.65	0.415	0.39	6.02	111.7	4.52	y
	16FWOU415WG	10/17/2016	1400	15.72	0	3.74	0.402	0.61	5.52	43.1	8.41	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
	16FWOU407WG	7/12/2016	1430	12.41	0	3.89	0.449	0.56	6.13	-34	78.95	Y
	16FWOU418WG	10/18/2016	1130	13.22	0	1.26	0.497	0.45	6.08	-35.6	9.41	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
	16FWOU412WG	7/12/2016	1800	15.04	0	2.72	0.860	1.58	6.34	176.4	6.99	Y
	16FWOU419WG	10/18/2016	1315	15.43	0	3.02	0.870	0.43	6.29	-56.9	3.42	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
	16FWOU401WG	7/11/2016	1000	17.73	0	5.56	0.732	0.38	5.86	27.6	4.87	Y
	16FWOU422WG	10/18/2016	1630	17.31	0	2.93	0.906	0.79	6.05	96.3	4.98	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
	16FWOU403WG	7/11/2016	1230	17.24	0	5.14	0.652	0.29	6.01	80.6	1.93	Y
	16FWOU421WG	10/18/2016	1515	16.86	0	3.40	0.654	0.38	5.67	142.4	1.32	Y

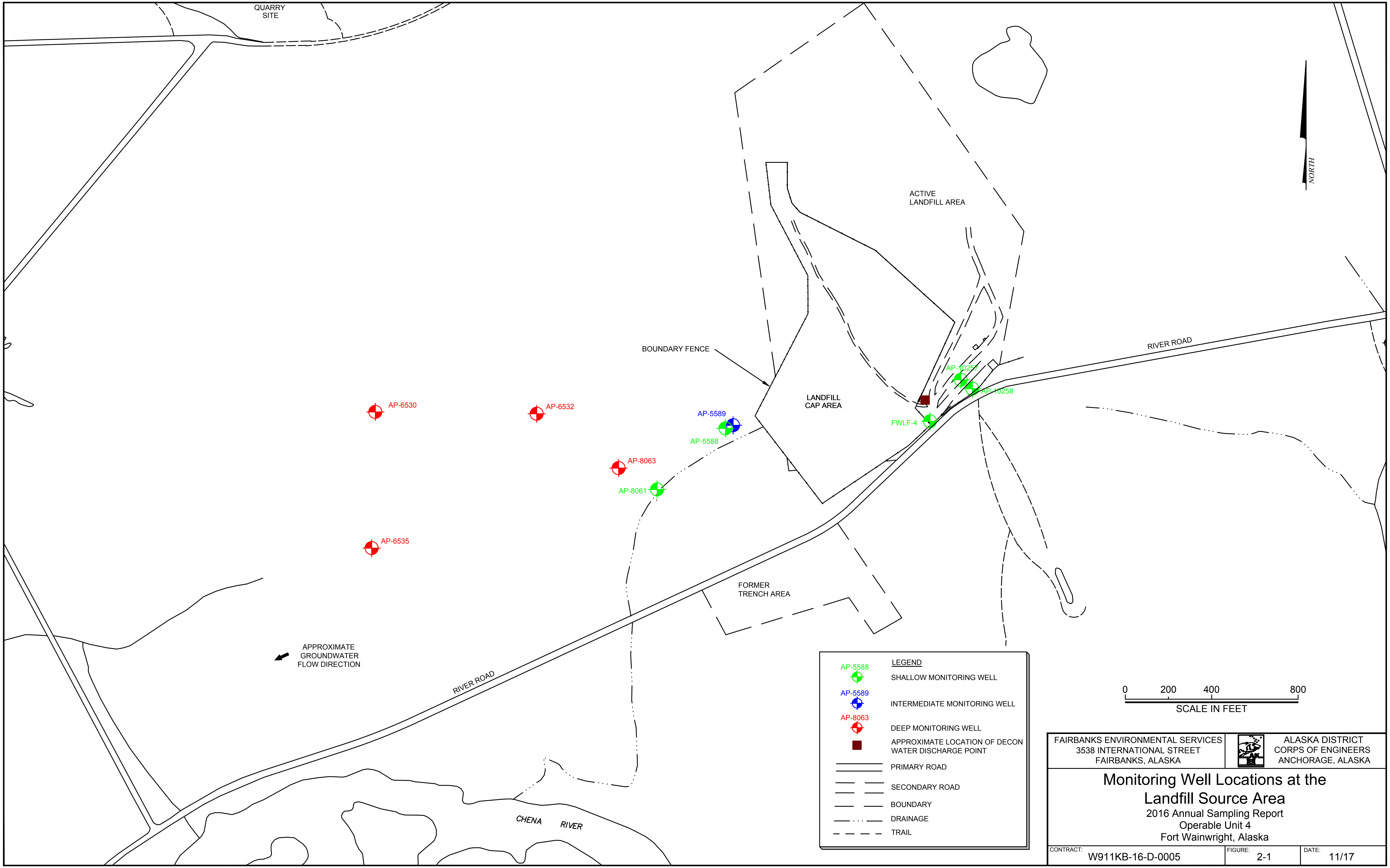
Notes:

[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 2016). Individual parameter stabilization discrepancies and potential impact to data quality is discussed in the CDQR.

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



LEGEND

AP-5588 ⊕	SHALLOW MONITORING WELL
AP-5589 ⊕	INTERMEDIATE MONITORING WELL
AP-8063 ⊕	DEEP MONITORING WELL
■	APPROXIMATE LOCATION OF DECON WATER DISCHARGE POINT
———	PRIMARY ROAD
— —	SECONDARY ROAD
— —	BOUNDARY
— · · · —	DRAINAGE
- - -	TRAIL

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Monitoring Well Locations at the Landfill Source Area

2016 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-16-D-0005
FIGURE: 2-1
DATE: 11/17

3.0 GROUNDWATER MONITORING RESULTS

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

3.1 Groundwater Elevations

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, nine intermediate wells, and seven 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 July and October 2016 were collected from wells screened across different elevations. Groundwater elevations measured in July were about 2 feet higher than April 2015 groundwater elevations and groundwater elevations measured in October 2016 were about 0.25 to 1.25 feet higher than November 2015 groundwater elevations. Water level measurements for 2016 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 July 2016 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

Ten monitoring wells were sampled at the Landfill during July 2016: five shallow wells, one intermediate well, and four deep wells. Seven of the ten monitoring wells were also sampled during October 2016: two shallow wells, one intermediate well, and four deep wells. Groundwater samples collected from wells screened across the water table are designated as shallow wells. These wells are sampled to investigate contaminants that migrate along the surface of the water table. One intermediate well screened below the groundwater table and above permafrost was 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 deep wells are sampled to monitor contaminants that are migrating in the aquifer below the permafrost.

Groundwater analytical results for the 2016 sampling events for select 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 during 2016 are listed below, and metals that exceeded the ADEC groundwater cleanup level are discussed in Section 3.2.3.

- AP-5588 – cis-1,2,-DCE, PCA, 1,1,2-Trichloroethane, and TCE
- AP-5589 – PCA and TCE
- AP-6532 – benzene and bis(2-ethylhexyl)phthalate
- AP-8063 – cis-1,2,-DCE, PCA, and TCE
- AP-10257 – benzene
- AP-10258 – benzene

Benzene was detected in all wells during 2016 monitoring events, but only exceeded the RAG in the same three wells during both the July and October 2016 sampling events (shallow wells AP-10257 and AP-10258, and deep well AP-6532).

A data quality review was performed, which indicated that all project data is acceptable for use. Only minor data qualifications were applied, which are detailed in the CDQR and ADEC Laboratory Data Review Checklists. The CDQR and ADEC checklists are presented in Appendix B, and a sample tracking table and analytical results table are provided in Appendix C.

Mann-Kendall trends for contaminant concentrations in individual wells at the OU4 Landfill were determined using the Monitoring and Remediation Optimization System (MAROS) software. The Air Force Center for Engineering and the Environment (AFCEE) developed the MAROS software (AFCEE, 2006) as a tool to evaluate groundwater data trends and is one among several tools that have been recommended for use in Long Term Monitoring Optimization (LTMO) (EPA, 2005). The trend analysis was completed using all available groundwater sampling results for wells in the current monitoring network. Some wells had monitoring results back to 1997, whereas results for newer wells were available since 2012. A Mann-Kendall trend was determined for COCs that exceeded the cleanup level during the period of analysis, or had concentrations at approximately half of the cleanup level in recent sampling events. The trend results are summarized in Table 3-4, with the complete results presented in (Appendix D). Visual depiction of contaminant concentrations over time are shown on Figures 3-4 through 3-10. Groundwater elevations over time are also shown on the graphs in Figures 3-4 through 3-10. A discussion of these trends is included in the discussion of the groundwater analytical results for the landfill wells in the following Section.

Table 3-4 Summary of 2016 Mann-Kendall Trend Analysis of OU4 Landfill Wells

Well	Benzene	Cis-1,2-Dichloroethylene (cis-1,2-DCE)	Trichloroethylene (TCE)	1,1,2,2-Tetrachloroehtane (PCA)	1,1,2-Trichloroethane
AP-10257	No Trend	--	--	--	--
AP-10258	Increasing	--	--	--	--
FWLF-4	Decreasing	--	--	--	--
AP-5588	Decreasing	Decreasing	Stable	Potentially Decreasing	Decreasing
AP-5589	Decreasing	--	Increasing	Potentially Increasing	--
AP-8061	Stable	Decreasing	Decreasing	--	--
AP-8063	Decreasing	Increasing	Potentially Increasing	No Trend	--
AP-6530	Potentially Decreasing	--	--	--	--
AP-6532	Increasing	--	--	--	--
AP-6535	Stable	No Trend	--	--	--

-- Analyte did not exceeded the cleanup level during the period of analysis, or did not have concentrations at approximately half of the cleanup level in recent sampling events

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; therefore only the data that has accumulated from sampling well AP-8061 is presented on Figure 3-5.

Shallow Monitoring Wells

Downgradient well AP-5588 (Figure 3-4). AP-5588 has historically exhibited the highest COC concentrations above RAGs for TCE, cis-1,2-DCE, PCA, and 1,1,2-trichloroethane. COC concentrations in this well exhibit overall decreasing trends. 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 well 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. Benzene decreased to below the RAG in July 2016, but overall, benzene concentrations have been stable in this well.
- 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. TCE decreased to below the RAG in July 2016 and overall is exhibiting a decreasing trend.
- 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, and AP-10258 (Figure 3-6). 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. Bis(2-ethylhexyl) phthalate exceeded the RAG in FWLF-4 during 2014 and 2015, but was not detected during the July 2016 monitoring event.

Two shallow wells (AP-10257 and AP-10258), located upgradient of the closed portion of the Landfill and 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 two 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 29 µg/L in spring 2016. Overall, there is no discernable trend for benzene in AP-10257.
- 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; however, it has been detected below the RAG in this well during previous sampling events. Bis(2-ethylhexyl) phthalate was not detected in this well in 2016.
- 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. Benzene was again above the RAG in AP-10258 during the spring and fall 2016 sampling events at 6.3 µg/L and 6 µg/L, respectively. Benzene exhibits an increasing trend in well AP-10258.

It is most likely that the benzene contamination detected in wells AP-10257 and AP-10258 is associated with the Landfill debris and it is not migration from the Building 1191 septic system.

<u>Intermediate Monitoring Well</u>

Downgradient Well AP-5589 (Figure 3-7). AP-5589 is co-located with shallow well AP-5588. TCE, PCA, and vinyl chloride have generally been detected below but have periodically exceeded their respective RAGs. Concentrations of benzene and cis-1,2-DCE, have consistently been detected at concentrations below the RAGs in this well.

- TCE in AP-5589 was detected slightly above the RAG during the spring 2007 and fall 2009 sampling events and has been just below the RAG during all other sampling events until fall 2016 when it was again detected slightly above the RAG at 5.1 µg/L. TCE is exhibiting a slight increasing trend in this well
- PCA in AP-5589 was detected above the RAG between 2005 and 2007, with the highest concentration (25.2 µg/L) detected in spring 2007. PCA decreased to below the RAG during fall 2007 and remained below the RAG with the exception of one detection of 5.6 µg/L in spring 2009; however, PCA was again detected above the RAG during the spring 2016 at 5.9 µg/L. PCA is potentially increasing in this well.
- 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.

The non-ROD contaminant pentachlorophenol was detected above the ADEC groundwater cleanup level in well AP-5589 during July 2016. This is the only known exceedance of pentachlorophenol.

Deep Monitoring Wells

Downgradient Monitoring Well AP-8063 (Figure 3-8). This well has been sampled since September 2001. TCE, PCA, and cis-1,2-DCE have historically been detected above the RAGs in AP-8063. Anomalous results occurred in 2004, 2009 and again during the April 2015 sampling event when these compounds were not detected. The sampling frequency of AP-8063 was decreased to annually following the spring 2015 sampling event; however, because of the anomalous results in 2015, the sampling frequency was return to biannually in 2016. TCE, PCA, and cis-1,2-DCE were again above the RAGs during the July and October 2016 sampling events. Benzene is consistently detected in AP-8063 at concentrations below the RAG.

- TCE was detected at its highest concentration to date during 2014 and 2016 at 29 µg/L. TCE is potentially increasing in this well with concentrations ranging between 15 and 29 µg/L.
- The PCA concentration peaked in fall 2003 at 77 µg/L; however, it decreased by an order of magnitude in spring 2004. PCA remained at concentrations near the RAG until spring 2008 when it began to steadily increase until it peaked again in 2011 at 61 µg/L. Concentrations of PCA have steadily decreased since 2011, but overall the PCA concentration in this well exhibits no discernible trend.
- Cis-1,2-DCE has shown an overall increasing trend, and was detected at its highest concentration to date in 2014, at 120 µg/L. Cis-1,2-DCE was detected at 110 µg/L during the spring and fall 2016.

Downgradient Monitoring Well AP-6532 (formerly identified as DH 6534) (Figure 3-9). Benzene has been consistently detected above the RAG and cis-1,2-DCE has been consistently detected below the RAG in this well since 2004. Bis(2-ethylhexyl) phthalate has exceeded the RAG in this well nine times since 1997. No other COC are detected in this well.

- 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, but increased to a concentration of 13 µg/L during both 2016 sampling events. Overall, benzene in this well exhibits an increasing trend.

The non-ROD contaminant, 2,6-dinitrotoluene (2,6-DNT), was detected above the ADEC cleanup level in well AP-6532 during the 2013 and 2015 spring and fall sampling events. 2,6-DNT was not detected during 2016. The source of 2,6-DNT at the Fort Wainwright landfill area cannot be conclusively determined. However, common uses of 2,6-DNT include the manufacturing of munitions, polyurethane polymers, and herbicides, which may be associated with the landfill contents.

Downgradient Monitoring Wells AP-6530 (Figure 3-10) and AP-6535. Two deep downgradient wells, AP-6530 and AP-6535, 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 11 sampling events at AP-6530. Benzene has been detected below the RAG since the fall 2014 and is potentially decreasing in AP-6530. Bis(2-ethylhexyl) phthalate has been detected in seven out of 11 sampling events and exceeded the RAG in this well once during fall 2014. Cis-1,2-DCE is also consistently detected below the RAG in AP-6530. Vinyl Chloride was detected below the RAG in 2013. No other COC are detected in this well.
- Benzene, cis-1,2-DCE and TCE have been detected below the RAG in AP-6535 during each sampling event since sampling of this well began in 2010. Vinyl Chloride has been detected below the RAG in eight out of nine sampling events and bis(2-ethylhexyl) phthalate has been detected below the RAG in six of nine sampling events. PCA has never been detected in this well.

Contaminant Flow Paths

Benzene

Benzene is detected in all wells sampled downgradient of the landfill, typically at concentrations below the RAG; however, historically benzene has been detected above the RAG in three wells located downgradient of the landfill: deep 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 3-11 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, cis-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 cis-1,2- DCE and vinyl chloride, chlorinated solvents are not seen in deep wells AP-6532 and AP-6530. Figure 3-12 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, where they continue migrating below permafrost.

3.2.2 SVOCs in Groundwater

Bis(2-ethylhexyl)phthalate is an OU4 COC that has been 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. However, it was detected above the RAG in three consecutive sampling events between April 2015 and July 2016 in deep downgradient well AP-6532. Bis(2-ethylhexyl)phthalate was below the RAG in this well in October 2016.

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 been shown to not 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 the ADEC groundwater cleanup level as listed in Title 18 Alaska Administrative Code (AAC) 75.345 (ADEC, 2016a). Background concentrations of arsenic in groundwater at Fort Wainwright have previously been shown to exceed the RAG (USACE, 1993). Table 3-3 presents groundwater monitoring results for the 15 trace metals typically reported for the Landfill during the last three years.

Arsenic was above the RAG of 10 µg/L in downgradient shallow monitoring well AP-5588 at a concentration of 12.4 µg/L and in shallow monitoring well AP-8061 at 10.4 µg/L during the July 2016 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 2016 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, cis-1,2-DCE, and vinyl chloride in downgradient monitoring wells is consistent with the occurrence of reductive dechlorination. Three reductive dechlorination reaction pathways can occur 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 cis-1,2-DCE (both cis- and trans- isomers) and vinyl chloride (USGS, 2003). 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. Abiotic dehydrochlorination eliminates the inhibitory compound and creates a product that can be degraded using bacteria. 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 cis-1,2-DCE can occur under mildly reducing conditions, similar to conditions suitable for iron reduction; whereas, the dechlorination of cis-1,2-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 Geochemical Data Evaluation

Groundwater geochemical data were collected during the 2016 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 2016 for wells located downgradient of the landfill.

- DO concentrations are 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 2016 sampling events, dissolved iron concentrations in wells downgradient of the Landfill ranged from 19 mg/L to 57.9 mg/L. 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 2016 sampling events, sulfate concentrations in upgradient wells ranged from 3.4 mg/L to 90.5 mg/L. In general, sulfate is detected above typical background concentrations in upgradient wells at the Landfill. Sulfate concentrations in downgradient wells ranged from 4.9 mg/L in AP-6532 (deep well) to 211 mg/L in AP-5588 (shallow well) during 2016 and are similar to background concentrations, indicating a wide range of sulfate concentrations and a complicated groundwater regime. Historically, sulfate concentrations were lower in downgradient wells relative to upgradient well concentrations and indicated a redox potential suitable for sulfate reduction in the downgradient wells.

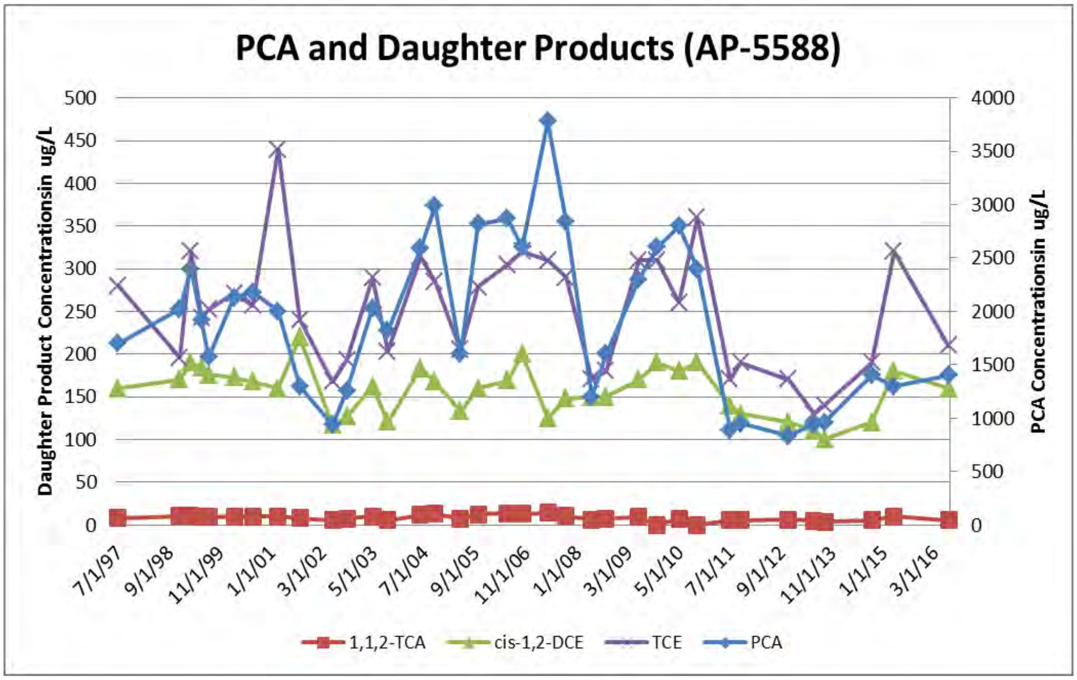
3.2.4.3 PCA Degradation Products in Groundwater

Concentrations of PCA and its three primary daughter products (1,1,2-trichloroethane, cis-1,2-DCE, and TCE) were graphed for the four wells that consistently exhibit the highest concentrations of these analytes including two shallow wells (AP-5588 and AP-8061), one intermediate well (AP-5589), and one deep well (AP-8063) located downgradient of the Landfill. Wells AP-5588 and AP-5589 are co-located but are screened at different intervals, AP-5588 is screened from 9 to 29 feet bgs and AP-5589 is screened from 46 to 56 feet bgs. PCA and daughter product concentrations were graphed to evaluate changes in these wells. The graphs are included as Graphs 3-1 through 3-4. Note that the three anomalous data points (representing severely low-biased data from October 2004, September 2009, and April 2014) in well AP-8063 were omitted in Graph 3-4.

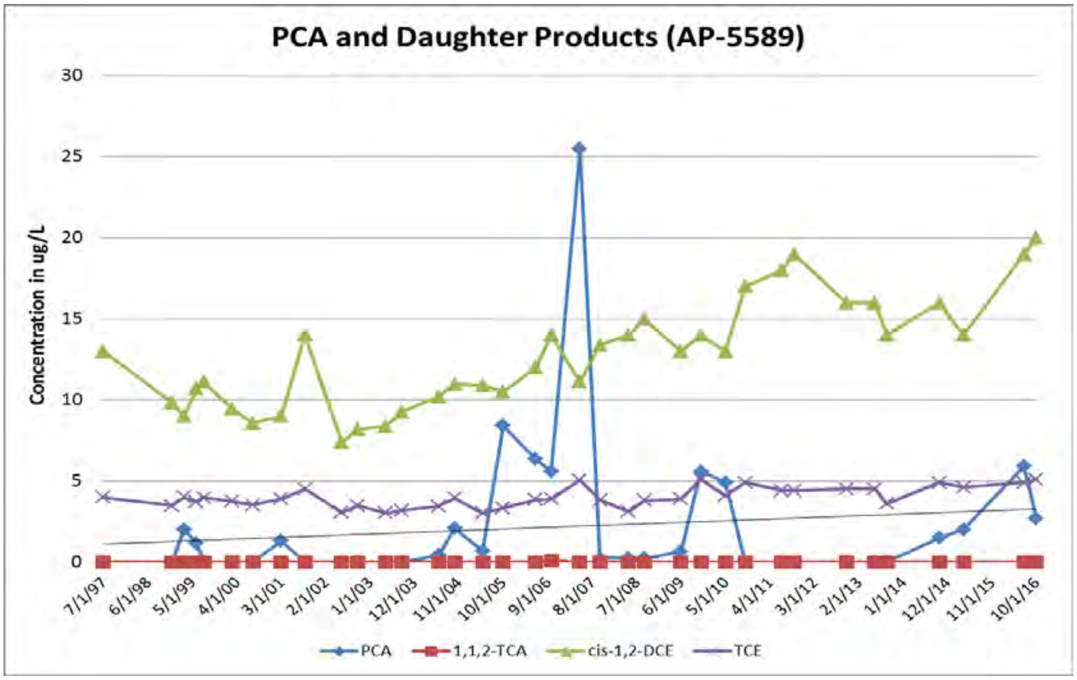
The relationship between PCA and its primary daughter products are further complicated by the fact that cis-1,2-DCE is also a daughter product of TCE, and that any of these analytes may be attributed to the Landfill contamination and are not necessarily daughter products of PCA. Cis-

1,2-DCE, for example, was detected in upgradient wells AP-10257 and AP-10258 but the presumed parent compound (PCA) was not.

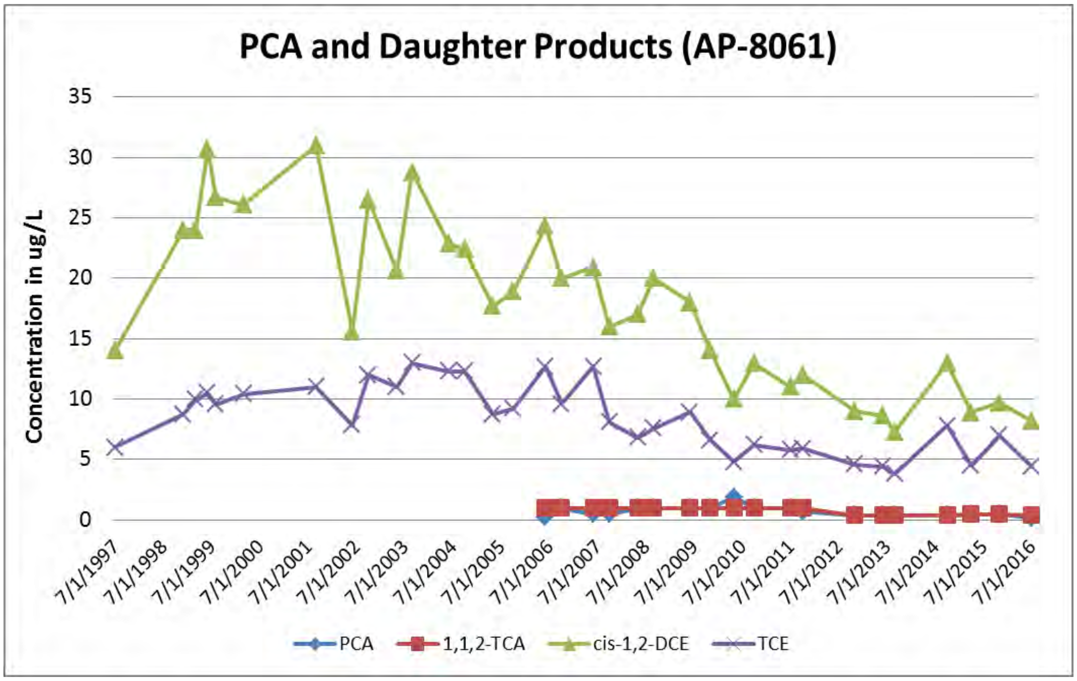
Graph 3-1. PCA and Daughter Products in AP-5588



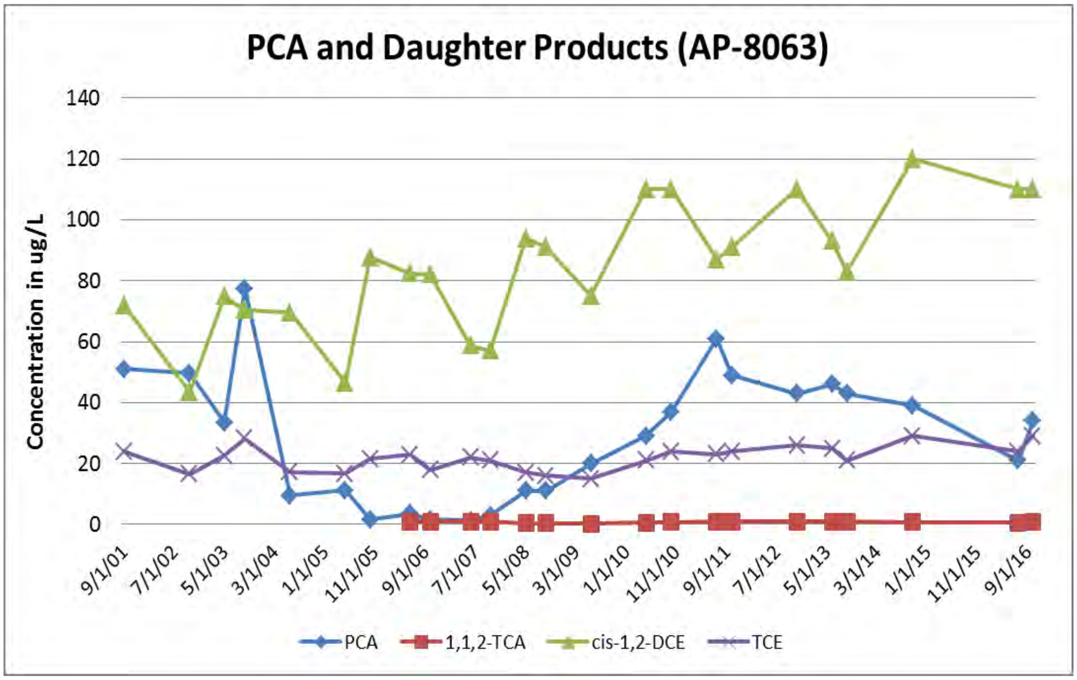
Graph 3-2. PCA and Daughter Products in AP-5589



Graph 3-3. PCA and Daughter Products in AP-8061



Graph 3-4. PCA and Daughter Products in AP-8063



The highest concentrations of PCA and daughter products are consistently detected in shallow well AP-5588 located closest to the Landfill. For this discussion, it is assumed that the contamination in wells AP-8061 and AP-8063 migrated from the upgradient area near wells

AP-5588. It is unknown whether the contamination detected in intermediate well AP-5589 stems from contamination present higher in the water column (represented by AP-5588) or directly from the landfill.

The following information was derived from the graphs:

- Well AP-5588 has the highest parent compound concentrations, and if PCA degradation was occurring and daughter products were being formed, it would likely be most evident in this well (assuming sufficiently reduced [anaerobic] conditions). Daughter products cis-1,2-DCE and TCE are present in AP-5588 at approximately one order of magnitude less than PCA, and the intermittent changes in concentrations of PCA, cis-1,2-DCE, and TCE between sampling events mirror each other (Graph 3-1). This indicates that reductive dechlorination of PCA (through the dechloroelimination and abiotic dechlorination pathways) is occurring and/or that all three of these compounds are contaminants emanating from the Landfill.

- For the purposes of this discussion, concentrations of daughter product 1,1,2-trichloroethane are negligible and likely indicates that the hydrogenolysis pathway is not a significant PCA degradation pathway and/or there is not a major source of this compound in the Landfill. Concentrations of 1,1,2-trichloroethane are detected at the RAG in AP-5588 but are not detected in any other wells except deep well AP-8063 (at concentrations an order of magnitude below the RAG).

- PCA concentrations in shallow well AP-5588 are significantly higher than the concentrations of all the daughter products in this well combined. The opposite is true for other three wells located downgradient of, or deeper than, AP-5588; the concentrations of daughter products cis-1,2-DCE and TCE were significantly higher than the parent PCA concentrations in shallow well AP-8061, intermediate well AP-5589, and deep well AP-8063 with exception of four consecutive data points in well AP-5589 (between 2005 and 2007). The significant increase in the ratio of daughter products to PCA in these wells may indicate that significant PCA degradation is occurring downgradient of, or deeper than, well AP-5588.

- The concentrations of TCE were consistently higher than cis-1,2-DCE concentrations in well AP-5588, while cis-1,2-DCE concentrations are consistently higher than TCE concentrations in the other three wells. The increase in the ratio of cis-1,2-DCE to TCE in wells located downgradient of AP-5588 is likely due to dechlorination of TCE to cis-1,2-DCE.

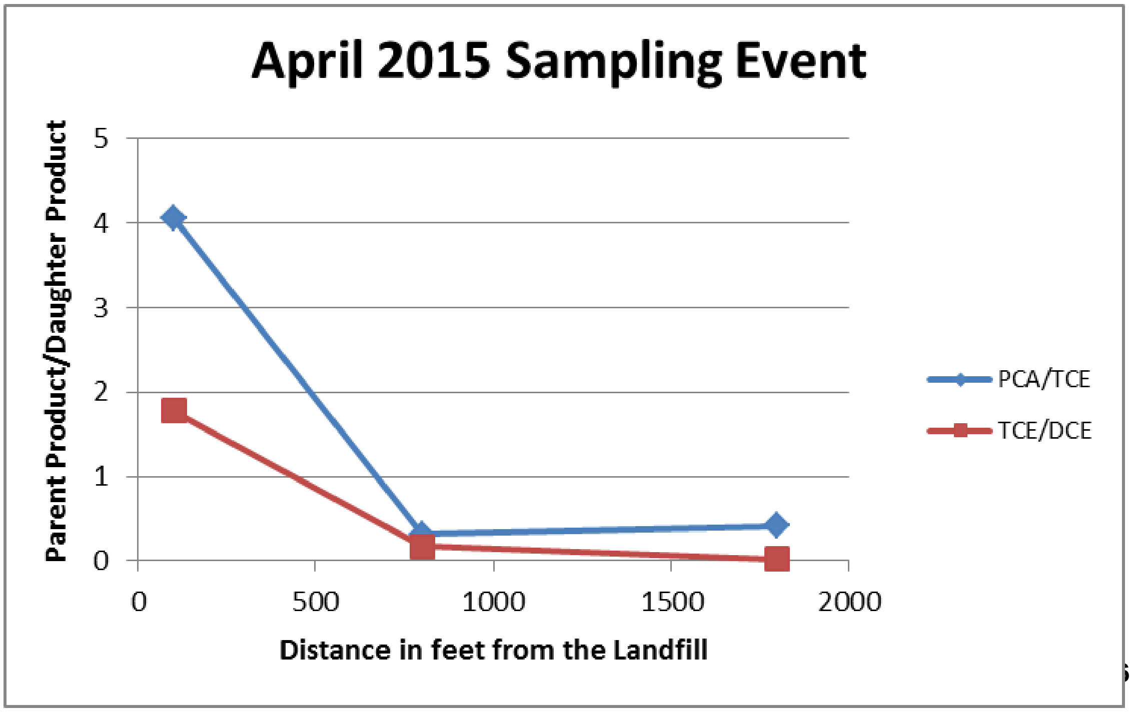
- Mann-Kendall analysis indicates that the concentrations of PCA in AP-5588 exhibits a potentially decreasing trend, whereas the concentrations of PCA are potentially increasing or exhibit no trend in wells AP-5589 and AP-8063, respectively (the PCA concentrations in shallow well AP-8061 are at the detection limit so no pattern can be differentiated from the data associated with that well). Cis-1,2-DCE and TCE concentrations exhibit decreasing or stable trends in both shallow wells (AP-5588 and AP-8061), but show an increasing or potentially increasing trend in deep well AP-8063 and intermediate well AP-5589. These changes indicate that the contaminant load is decreasing and that the center of the contaminant mass is potentially moving downward and away from the Landfill.

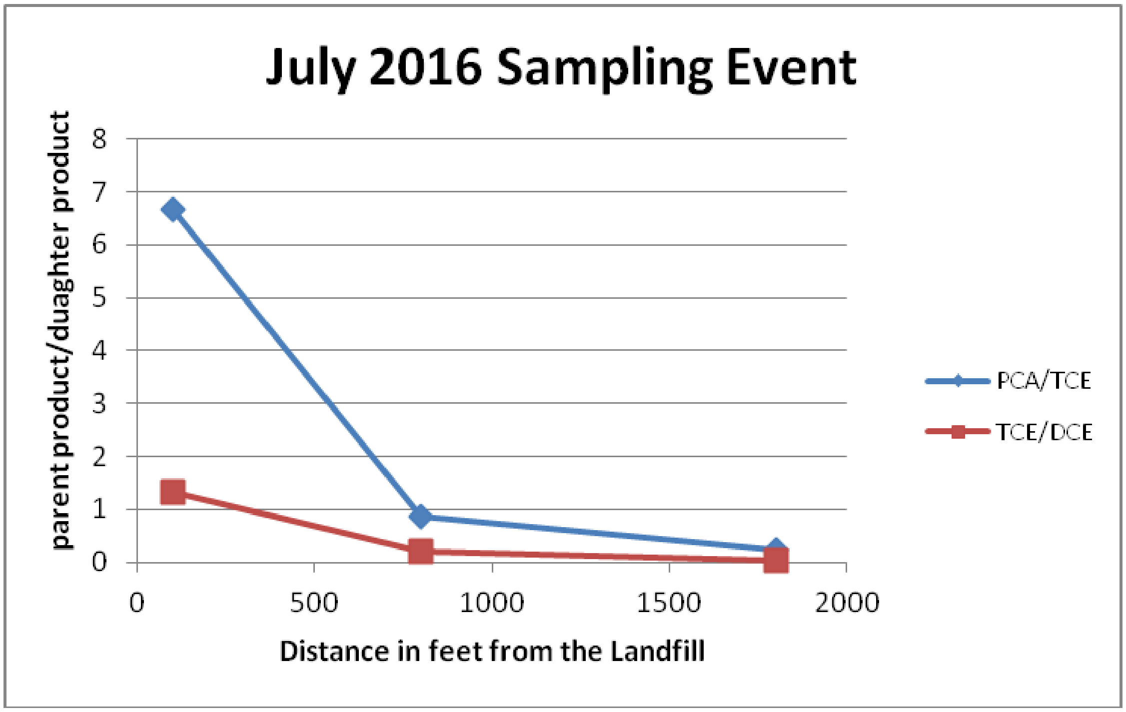
In general, degradation of PCA and TCE appears to be occurring based on increases of cis-1,2-DCE concentrations relative to parent (PCA and TCE) concentrations with distance away from the Landfill source as further discussed below.

The highest concentrations of PCA, TCE, and cis-1,2-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 cis-1,2-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/ cis-1,2-DCE) also show decreasing trends, as shown in Graphs 3-5 and 3-6. Graphs 3-5 and 3-6 depict the ratios of parent to daughter products during April 2015 and July 2016 sampling events, respectively, along the southwesterly flow path encompassing wells AP-5588, AP-8063, and AP-6535 (as shown on cross-section Figure 3-12). 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 3-5. Parent to Daughter Product Ratios with Distance from the Landfill (April 2015)





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 2016. Methane concentrations in wells downgradient of the Landfill ranged from 9.9 µg/L in AP-6530 (deep well) to 1,400 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-10257 (1,500 µg/L) and AP-10258 (360 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 2016

Well Number	Total Depth (below TOC)	Screened Interval (feet bgs)	Relative Depth	TOC Elevations	Depth to Water from TOC July 2016	Groundwater Elevation July 2016	Depth to Water from TOC October 2016	Groundwater Elevation October 2016
FWLF-4	25.10	13.5-23.5	Shallow	452.23	15.90	436.33	NA	NA
AP-5588	29.05	7-27	Shallow	451.13	14.87	436.26	NA	NA
AP-5589	56.41	47.5-57.5	Intermediate	452.13	15.85	436.28	16.00	436.13
AP-8061	25.29	15-25	Shallow	444.13	7.87	436.26	NA	NA
AP-8063	116.30	110-120	Deep	451.21	15.04	436.17	15.43	435.78
AP-6532	173.65	170-177	Deep	451.17	14.98	436.19	15.72	435.45
AP-6530	136.24	136.2-142.2	Deep	450.06	14.13	435.93	14.93	435.13
AP-6535	90.75	87.1-93.1	Deep	448.09	12.41	435.68	13.22	434.87
AP-10257	24.45	11.5-21.5	Shallow	454.01	17.73	436.28	17.31	436.70
AP-10258	23.80	11-21	Shallow	453.54	17.24	436.30	16.86	436.68

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	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	4.3	5	5	2	6
FWLF-4	10FW402WG	5/26/2010	433.80	32.00	32.00	29	1.2	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	5.4
	10FW422WG	10/5/2010	434.00	32.00	43.50	36	1.1	0.50 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(4.8)
	11FW401WG	7/14/2011	436.67	32	54	110	0.94	0.36 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.49 J,QH
	11FW427WG	10/12/2011	435.02	21	53	70	0.84 J	0.37 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	0.37 J,B,QL
	12FW434WG	11/13/2012	429.53	30	48	120	0.51 J	0.31 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.80)	1.1 J
	13FW414WG	6/18/2013	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	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	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	434.3	28	50	120	0.88 J	0.29 J	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	**9.5**
	16FWOU404WG	7/11/2016	436.33	26.4	56.9	43	1.9	0.62	ND(0.2)	ND(0.4)	ND(0.1)	ND(0.1)	ND(1.9)
AP-5588	10FW404WG	5/25/2010	433.82	29.20	94.40	1,200	2.2	**180**	**2,800**	**7.3**	**260**	0.51 J	0.63 J
	10FW419WG	10/4/2010	433.83	27.5	153	1,100	ND(50)	**190**	**2,400**	ND(50)	**360**	ND(50)	ND(4.8)
	11FW403WG	7/14/2011	436.56	36	160	2,200	2.6	**140**	**890**	**5.2**	**170**	1.5	0.53 J,QH
	11FW421WG	10/10/2011	434.96	27	140	1,100	1.9	**130**	**950**	**5.7**	**190**	1.0 J	ND(5)
	12FW427WG	11/12/2012	434.5	31	130	1,700	2.0 J	**120**	**830**	**6.2**	**170**	ND(4.0)	1.1 J
	13FW410WG	6/17/2013	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	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	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	434.13	37	190	1,800	1.8	**180 J**	**1300 J**	**10**	**320**	0.87 J	1.2 J
	16FWOU411WG	7/12/2016	436.26	42	211	430	2.2 J	**160**	**1,400**	**5.8**	**210**	0.95 J	ND(2.0)
AP-5589	10FW405WG	5/25/2010	433.82	37.5	76.6	2,400	2.8	13	4.9	ND(1)	4.1	ND(1) Q	ND(9.6)
	10FW417WG	10/4/2010	433.83	39	92.1	1,400	3.5	17	ND(1)	ND(1)	4.9	0.97 J	1.6 J
	11FW404WG	7/14/2011	436.56	50	140	2,700	3.3	18	ND(1.0)	ND(1.0)	4.4	1.2 J	0.79 J,Q
	11FW420WG	10/10/2011	434.98	44	130	2,800	3.1	19	ND(1.0)	ND(1.0)	4.4	0.85 J	ND(5.2)
	12FW429WG	11/12/2012	434.38	31	140	5,300	2.6	16	0.31 J	ND(0.40)	4.5	0.66 J	0.97 J,QH
	13FW409WG	6/17/2013	435.93	40	130	1,700	3	16	ND(0.40)	ND(0.40)	4.5	0.60 J	**23**
	13FW427WG	9/10/2013	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	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	434.15	50	120	3,400	3.3	14	2	ND(0.50)	4.6	1.1	ND(1.9)
	16FWOU408WG	7/12/2016	436.28	50.2	137	740	3.9	19	**5.9**	ND(0.4)	4.9	1.1	ND(1.9)
	16FWOU417WG	10/18/2016	436.13	49.2	133	610	4	20 J+	2.7 J+	ND(0.4)	**5.1**	1.3	ND(1.9)
AP-8061	10FW407WG	5/25/2010	433.73	29.5	20	280	4.7	10	1.9	ND(1)	4.8	ND(1)	ND(15)
	10FW414WG	10/4/2010	433.71	NM	NM	610	**5.8**	13	ND(1)	ND(1)	**6.2**	0.24 J	1.3 J
	11FW406WG	7/15/2011	436.39	31	38	460	**5.3**	11	ND(1.0)	ND(1.0)	**5.8**	ND(1.5)	0.3 J
	11FW419WG	10/10/2011	434.83	29	37	670	4.8	12	ND(1.0)	ND(1.0)	**5.9**	ND(1.5)	ND(5.1)
	12FW430WG	11/12/2012	434.45	29	30	880	4.3	9	0.71 J	ND(0.40)	4.6	ND(0.80)	0.92 J
	13FW413WG	6/17/2013	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	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	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	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	436.42	30	40	630	**5.4**	9.7	ND(0.50)	ND(0.50)	**7**	ND(0.50)	ND(2.1)
	16FWOU405WG	7/11/2016	436.26	29.8	37.5	92	3.5	8.2	ND(0.2)	ND(0.4)	4.4	0.16 J	ND(1.9)
AP-6532	10FW409WG	5/26/2010	433.47	27	0	5,300	**11**	3.4	ND(1)	ND(1)	ND(1)	ND(1)	ND(9.6)
	10FW424WG	10/5/2010	433.42	NM	NM	5,200 QH	**12**	3.4	ND(1)	ND(1)	ND(1)	ND(1)	1.4 J
	11FW411WG	7/18/2011	435.67	28	ND(0.50)	5,300	**11**	3.3	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	0.74 J,QH
	11FW422WG	10/11/2011	434.38	26	0.58	5,300 J	**10**	2.8	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	0.33 J,B
	12FW424WG	11/6/2012	434.47	4.9	7.4	1,500	2.4	0.66 J	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.80)	1.2 J,QH
	13FW418WG	6/19/2013	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	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	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	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	436.25	27	3.4	1,500	**11**	2.8	ND(0.50)	ND(0.50)	ND(1)	0.25 J	**19**
	16FWOU409WG	7/12/2016	436.19	28.9	4.9	1,200	**13**	3	ND(0.2)	ND(0.4)	ND(0.1)	0.2 J	**10 J**
	16FWOU410WG[1]			30.3	5	1,300	**13**	3.1	ND(0.2)	ND(0.4)	ND(0.1)	0.22 J	**23 J**
	16FWOU415WG	10/17/2016	435.45	27.5	5.1	1,400	**13**	3 J+	ND(0.2)	ND(0.4)	ND(0.1)	0.26 J	4.4 J
AP-8063	10FW411WG	5/26/2010	433.64	50	58.1	3,000	2.8	**110**	**29**	0.66 J	**21**	0.76 J	1.1 J
	10FW415WG	10/4/2010	433.59	11.2	70.8	1,300	3	**110**	**37**	0.83 J	**24**	1.2	ND(5.2)
	11FW415WG	7/18/2011	435.91	49	110	2,900	2.6	**87**	**61**	0.89 J	**23**	1.3 J	0.77 J
	11FW424WG	10/11/2011	434.6	49	110	3,400	2.7	**91**	**49**	0.94 J	**24**	1.2 J	**15**
	12FW422WG	11/5/2012	434.7	56	120	4,600	2.5	**110**	**43**	0.92 J	**26**	1.2 J	1.2 J,QH
	13FW406WG	6/17/2013	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	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	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	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
	16FWOU412WG	7/12/2016	436.17	57.9	126	520	2.1	**110**	**21**	0.53	**24**	1.3	ND(1.9)
	16FWOU419WG	10/18/2016	435.78	53.1	131	650	2.4	**110 J+**	**34 J,J+**	0.71	**29**	1.3	ND(2.4)
	16FWOU420WG[1]			53.4	137	680	2.2	**93 J+**	**25 J,J+**	0.58	**25**	1.3	ND(2.4)
AP-6530	10FW427WG	10/13/2010	432.96	2.7	NM	290	0.69 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(52)
	11FW410WG	7/18/2011	435.43	26	39	2,100	**5.7**	1.6	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	0.43 J,QH
	11FW426WG	10/12/2011	434.08	20	32	1,400	4.2	0.90 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	0.50 J,B
	12FW420WG	11/5/2012	434.26	18	18	570	2.5	0.54 J	ND(0.40)	ND(0.40)	ND(2.0)	ND(0.80)	1.1 J
	13FW415WG	6/18/2013	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	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	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	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	436.04	20	16	120	1.9	0.26 J	ND(0.50)	ND(0.50)	ND(1)	ND(0.50)	3.5
	16FWOU406WG	7/12/2016	435.93	20.4	11.6	15	1.7	0.18 J	ND(0.2)	ND(0.4)	ND(0.1)	ND(0.1)	ND(1.9)
	16FWOU416WG	10/17/2016	435.13	19	9.5	9.9	1.3	0.15 J,J+	ND(0.2)	ND(0.4)	ND(0.1)	ND(0.1)	ND(1.9)
AP-6535	10FW429WG	10/13/2010	431.7	18.5	0	1000 QH	3.6	33	ND(1)	ND(1)	0.65 J	0.9 J	1.4 J
	11FW414WG	7/18/2011	435.09	28	14	810	3.4	34	ND(1.0)	ND(1.0)	0.57 J	1.1 J	0.49 J
	12FW421WG	11/5/2012	434.04	29	14	1,600	3.1	31	ND(0.40)	ND(0.40)	0.58 J	1.0 J	1.6 J
	13FW408WG	6/17/2013	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	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	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	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	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)
	16FWOU407WG	7/12/2016	435.68	27.8	18.4	220	3.4	35	ND(0.2)	ND(0.4)	0.87	1.2	ND(2)
	16FWOU418WG	10/18/2016	434.87	24.2	17.5	240	2.9	28	ND(0.2)	ND(0.4)	0.66	1.1	ND(2)
AP-10257	12FW433WG	11/13/2012	434.56	10	46	1,400	**14**	3.9	ND(0.40)	ND(0.40)	ND(0.20)	ND(0.80)	1.1 J
	13FW405WG	6/17/2013	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	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	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	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	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**
	16FWOU401WG	7/11/2016	436.28	8.13	3.4	1,400	**29**	6.6	ND(0.2)	ND(0.4)	0.15 J	0.12 J	ND(1.9)
	16FWOU402WG[1]			8.04	3.4	1,500	**28**	6.6	ND(0.2) J-	ND(0.4)	0.14 J	0.12 J	ND(1.9)
	16FWOU422WG	10/18/2016	436.7	3.22	127	620	**7.3**	3.3 J+	ND(0.2)	ND(0.4)	ND(0.1)	0.1 J	ND(2)
AP-10258	12FW436WG	11/14/2012	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	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	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	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	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	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)
	16FWOU403WG	7/11/2016	436.30	1.84	90.5	360	**6.3**	4.4	ND(0.2)	ND(0.4)	0.11 J	ND(0.1)	ND(1.9)
	16FWOU421WG	10/18/2016	436.68	0.255	161	430	**6**	3.3 J+	ND(0.2)	ND(0.4)	ND(0.1)	ND(0.1)	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, or because of a QC failure.

J+ - result qualified as high-baised estimate because of a QC failure

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)
2016 MCLs in μg/L			**6**	**10**	**2,000**	**4**	**5**	**100**	**NA**	**1,000**	**15**	**100**	**50**	**180**	**2**	**260**	**5,000**
2017 MCLs in μ g/L			*7.8*	*0.52*	*3,800*	*25*	*9.2*	*NA*	*NA*	*800*	*15*	*390*	*100*	*94*	*0.2*	*86*	*6,000*
FWLF-4	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)
	16FWOU404WG	7/11/2016	0.053	6.6	324	ND(0.02)	0.034	0.38	3.7	0.46	0.038	4.41	0.4 J	ND(0.01)	ND(0.005)	0.66	2.3
AP-5588	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)
	16FWOU411WG	7/12/2016	0.072	**12.4**	500	0.012 J	0.007 J	0.88	1.42	0.52	0.012 J	4.5	1 J	ND(0.01)	ND(0.005)	2.33	0.9
AP-5589	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)
	16FWOU408WG	7/12/2016	0.066	0.9	606	0.022	ND(0.02)	1.27	0.244	0.42	0.055	1.24	0.6 J	ND(0.01)	ND(0.005)	3.87	1.4
	16FWOU417WG	10/18/2016	0.111 B	0.92	619	0.037	0.011 B	1.73 B	0.157 B	1.14	0.065 B	0.73 B	ND(1)	ND(0.01)	0.003 J	5.02	1.56 B
AP-8061	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)
	16FWOU405WG	7/11/2016	0.081	**10.4**	575	0.018 J	ND(0.02)	0.79	0.207	1.21	0.103	0.69	ND(1)	ND(0.01)	ND(0.005)	2.75	0.7
AP-6532	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
	16FWOU409WG	7/12/2016	1.45	1.1	251	0.037	0.017 J	2.67	0.247	5.14	2.09	2.51 J-	ND(1)	ND(0.01)	ND(0.005)	3.19	24.6
	16FWOU410WG		1.31	1.1	253	0.03	0.011 J	2.54	0.211	4.6	1.94	1.98 J-	ND(1)	ND(0.01)	ND(0.005)	3.29	21
	16FWOU415WG	10/17/2016	0.797 B	0.98	241	0.037	0.009 J,B	9.6	0.303	3.2	1.04	5.03	ND(1)	ND(0.01)	ND(0.01)	3.69	12.1
AP-8063	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
	16FWOU412WG	7/12/2016	0.2	2.5	677	0.028	0.019 J	1.61	0.393	1.51	1.06	1.75	0.6 J	ND(0.01)	ND(0.005)	2.38	39.7
	16FWOU419WG	10/18/2016	0.118	2.57	713	0.021	0.02 J	1.16	0.135	0.25	0.12	0.91	ND(1)	ND(0.01)	0.007 J	2.6	86.6
	16FWOU420WG		0.106	2.77	748	0.025	ND(0.01)	1.09	0.131	0.25	0.119	0.8	ND(1)	ND(0.01)	ND(0.01)	2.54	82.9
AP-6530	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)
	16FWOU406WG	7/12/2016	0.109	4.8	315	0.023	0.019 J	0.78	0.126	2.4	0.584	0.51	ND(1)	ND(0.01)	ND(0.005)	1.92	7.5
	16FWOU416WG	10/17/2016	0.026 J,B	4.86	326	0.017 J	ND(0.01)	0.5 B	0.057 B	0.22 B	0.06 B	0.13 J,B	ND(1)	ND(0.01)	ND(0.01)	2.01	1.1 B
AP-6535	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)
	16FWOU407WG	7/12/2016	0.557	3.9	283	0.084	0.106	6.5	0.642	30.2	3.99	2.25	ND(1)	0.012 B	ND(0.005)	5.63	36.7
	16FWOU418WG	10/18/2016	0.391 B	3.36	268	0.05	0.047	2.84 B	0.297	10	1.37	0.99 B	ND(1)	0.009 J	0.004 J	3.98	13.2
AP-10257	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
	16FWOU401WG	7/11/2016	0.433	1.6	387	0.023	0.432	1.39	20.1	3.74	0.091	71.3	0.9 J	0.011 B	ND(0.005)	2.73	50.7
	16FWOU402WG		0.456	1.5	388	0.019 J	0.408	1.38	20	3.81	0.095	70	0.7 J	0.009 J,B	ND(0.005)	2.72	51
	16FWOU422WG	10/18/2016	1.77 B	2.96	254	0.029	0.68	1.72 B	39.4	10.1	0.252	97.3	0.5 J	0.034	0.037	3.53	34.4
AP-10258	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
	16FWOU403WG	7/11/2016	1.1	0.4 J	96.9	0.054	0.518	0.74	41.8	5.07	0.08	**145**	ND(1)	ND(0.01)	ND(0.005)	1.02	70.4
	16FWOU421WG	10/18/2016	0.866 B	1.17	63.9 B	0.229	2.35	0.98 B	172	13.2	0.448	**338**	0.8 J	0.018 J,B	0.034	2.07	298

Notes:

Results in bold denote concentrations above groundwater cleanup levels established in Table C, 18 AAC 75.345 (ADEC, May 2016). Groundwater cleanup levels established in Table C, 18 AAC 75.345 after project inception are included for reference (ADEC, April 2017)

[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, or because of a QC failure

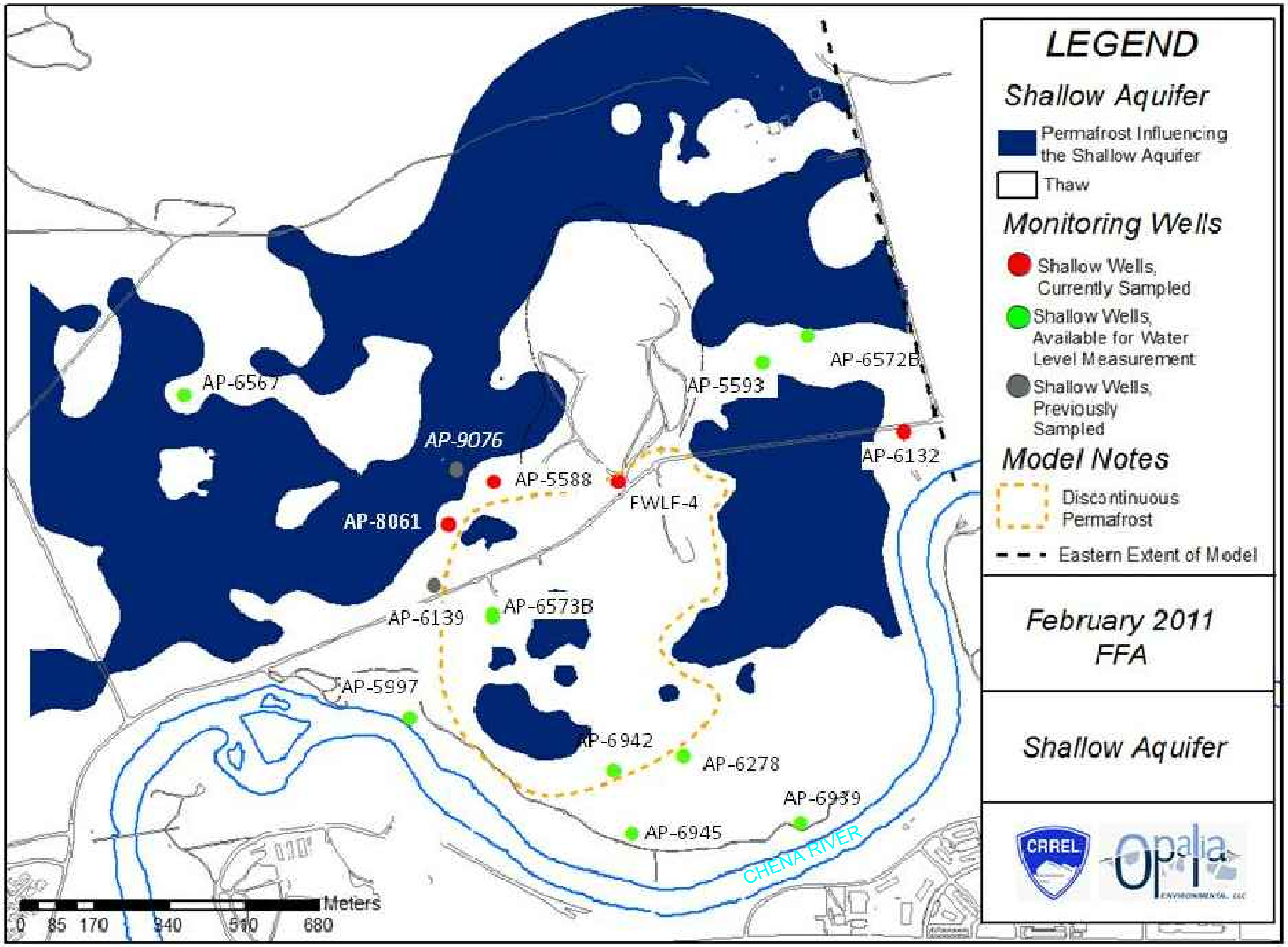
J- - result qualified as a low-biased estimate because because of a QC failure

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.)



SOURCE:
CRREL AND OPALIA ENVIRONMENTAL INC, FFA MEETING FEBRUARY 2011

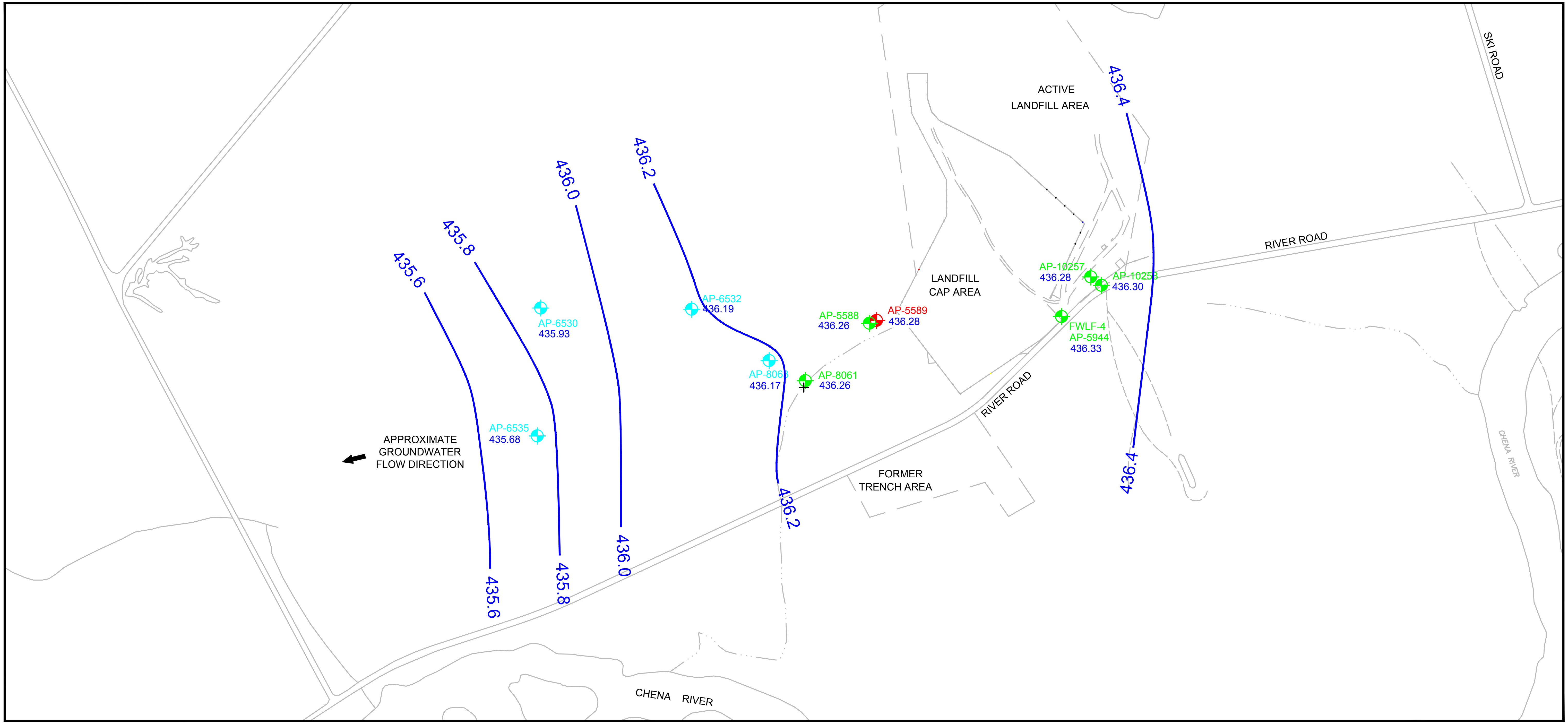
FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Permafrost Distribution at the Landfill Source Area

2016 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-16-D-0005	FIGURE: 3-1	DATE: 11/17



LEGEND

🟥 AP-5589 436.28	INTERMEDIATE WELLS <90 FEET (WITH GROUNDWATER ELEVATION)
🟦 AP-6535 435.68	DEEP WELLS >90 FEET (WITH GROUNDWATER ELEVATION)
🟩 AP-5588 436.26	SHALLOW WELLS <30 FEET (WITH GROUNDWATER ELEVATION)
▬	JULY 2016 GROUNDWATER CONTOURS

NORTH

0 250 500 1,000
SCALE IN FEET

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

July 2016 Groundwater Contours at the Landfill

2016 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-16-D-0005
FIGURE: 3-2
DATE: 11/17

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	JULY 16	OCT 16
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	436.28	436.13
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	3.9	4.0
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	19	20
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	5.9	2.7
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)	ND(0.4)	ND(0.4)
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	4.9	5.1
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	1.1	1.3
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)	ND(1.9)	ND(1.9)
Methane																									6,200	2,400	1,400	2,700	2,800	5,300	1,700	4,200	4,100	3,400	740	610

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	JULY 16
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	436.26
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	2.2
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	160
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	1,400
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	5.8
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	210
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	0.95
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	ND(2)
Methane																									3,800	1,200	1,100	2,200	1,100	1,700	1,100	1,700	1,400	1,800	430

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 REMOVED FROM SAMPLING PROGRAM

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 REMOVED FROM SAMPLING PROGRAM

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	JULY 16
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	436.33
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	1.9
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	0.62
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)	ND(0.2)
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)	ND(0.4)
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)	ND(0.1)
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)	ND(0.1)
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	ND(1.9)
Methane																								120	29	36	110	70	120	120	220	190	120	43

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 REMOVED FROM SAMPLING PROGRAM

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 REMOVED FROM SAMPLING PROGRAM

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	JULY 16	OCT 16
Groundwater Elevation (feet)	434.51	436.22	434.40	436.31	434.36	436.76	436.28	436.70
Benzene	14	3.4	17	7.0	14	7.4	29	7.3
cis-1,2-Dichloroethene	3.9	1.6	3.9	2.0	3.3	3.1	6.6	3.3
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)	ND(0.2)	ND(0.2)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)	ND(0.4)	ND(0.4)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)	ND(1)	ND(1)	0.15	ND(0.1)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)	0.12	0.10
bis (2-ethylhexyl)phthalate	1.1	1.1	1.1	ND(2.0)	4.1	ND(2.1)	ND(1.9)	ND(2)
Methane	1,400	46	1,200	300	2,500	2,700	1,500	620

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	JULY 16	OCT 16
Groundwater Elevation (feet)	434.64	436.22	434.42	436.29	434.39	436.77	436.30	436.68
Benzene	ND(0.2)	0.40	2.7	5.7	4.9	3.4	6.3	6.0
cis-1,2-Dichloroethene	0.45	0.39	1.7	2.5	3.5	2.9	4.4	3.3
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)	ND(0.2)	ND(0.2)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)	ND(0.4)	ND(0.4)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(1)	ND(1)	0.11	ND(0.1)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.5)	ND(0.5)	ND(0.1)	ND(0.1)
bis (2-ethylhexyl)phthalate	0.98	0.76	ND(0.26)	ND(2.9)	ND(1.9)	ND(2.0)	ND(1.9)	ND(1.9)
Methane	15	44	160	280	480	680	360	430

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 REMOVED FROM SAMPLING PROGRAM

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	JULY 16	OCT 16
Groundwater Elevation (feet)	432.96	435.43	434.08	434.26	434.84	434.24	434.81	433.36	436.04	435.93	435.13
Benzene	0.69	5.7	4.2	2.5	5.8	5.0	3.2	3.0	1.9	1.7	1.3
cis-1,2-Dichloroethene	ND(1.0)	1.6	0.90	0.54	1.8	1.6	0.42	0.62	0.26	0.18	0.15
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)	ND(0.2)	ND(0.2)
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)	ND(0.4)	ND(0.4)
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)	ND(0.1)	ND(0.1)
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)	ND(0.1)	ND(0.1)
bis (2-ethylhexyl)phthalate	ND(52)	0.43	0.50	1.1	1.3	1.1	27	ND(2.2)	3.5	ND(1.9)	ND(1.9)
Methane	290	2,100	1,400	570	2,800	3,900	530	330	120	15	9.9

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 REMOVED FROM SAMPLING PROGRAM

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	JULY 16	OCT 16
Groundwater Elevation (feet)	431.7	435.09	434.04	434.70	434.10	434.39	433.14	435.74	435.68	434.87
Benzene	3.6	3.4	3.1	3.3	2.1	3.3	3.0	3.4	3.4	2.9
cis-1,2-Dichloroethene	33	34	31	33	22	34	31	33	35	28
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)	ND(0.2)	ND(0.2)
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)	ND(0.4)	ND(0.4)
Trichloroethene	0.65	0.57	0.58	0.95	0.33	0.73	0.55	0.60	0.87	0.66
Vinyl Chloride	0.9	1.1	1.0	0.86	0.66	1.1	1.0	ND(0.5)	1.2	1.1
bis (2-ethylhexyl)phthalate	1.4	0.49	1.6	1.1	0.95	2.3	ND(2.3)	ND(2.1)	ND(2)	ND(2)
Methane	1,000	810	1,600	1,100	2,100	1,800	1,100	1,600	220	240

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 REMOVED FROM SAMPLING PROGRAM

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	JULY 16
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	436.26
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	3.5
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	8.2
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)	ND(0.2)
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)	ND(0.4)
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	4.4
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)	0.16
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)	ND(1.9)
Methane																	960	280	610	460	670	880	260	600	560	440	630	92

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	JULY 16	OCT 16
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	436.19	435.45
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	13	13
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	3.1	3.0
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)	ND(0.2)	ND(0.2)
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)	ND(0.4)	ND(0.4)
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)	ND(0.1)	ND(0.1)
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	0.22	0.26
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	23	4.4
Methane																									1,400	5,300	5,200	5,300	5,300	1,500	2,200	5,900	4,300	3,600	1,500	1,300	1,400

* 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	JULY 16	OCT 16
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	435.02	435.78
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)	2.1	2.4
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	110	110
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)	21	34
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)	0.53	0.71
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	24	29
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)	1.3	1.3
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	ND(1.9)	ND(2.4)
Methane																	440	3,000	1,300	2,900	3,400	4,600	2,800	4,700	3,100	2,100	520	680

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)	0.33	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

WELL REMOVED FROM SAMPLING PROGRAM

* 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

WELL REMOVED FROM SAMPLING PROGRAM

LEGEND

AP-5588	SHALLOW MONITORING WELL
AP-5589	INTERMEDIATE MONITORING WELL
AP-8063	DEEP MONITORING WELL
AP-6138	MONITORING WELL NO LONGER IN SAMPLING PROGRAM
ND	INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANTITATION LIMIT IS STATED IN PARENTHESES.

PRIMARY ROAD
SECONDARY ROAD
BOUNDARY
DRAINAGE
TRAIL

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

2016 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-16-D-0005
FIGURE: 3-3
DATE: 11/17

Figure 3-4 Historical Contaminant Concentrations in AP-5588

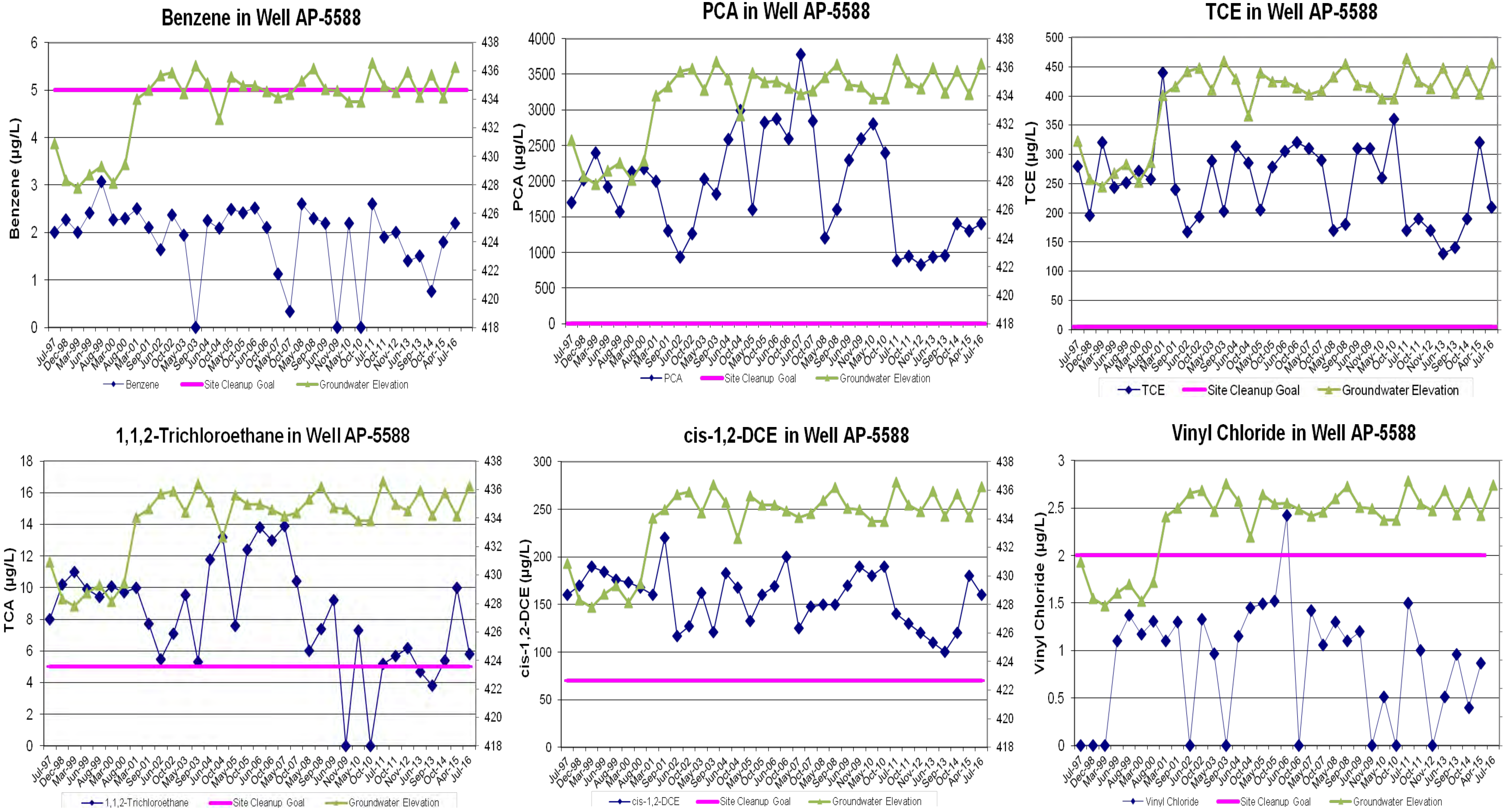
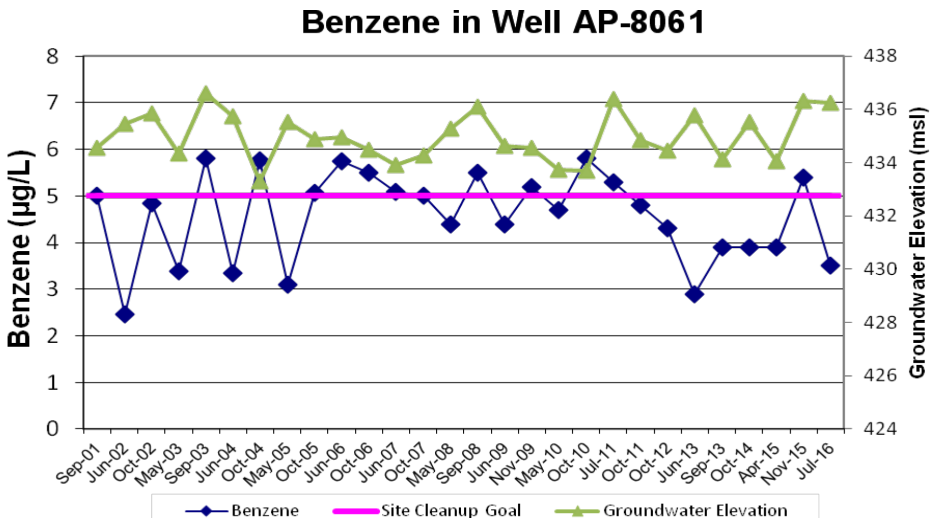
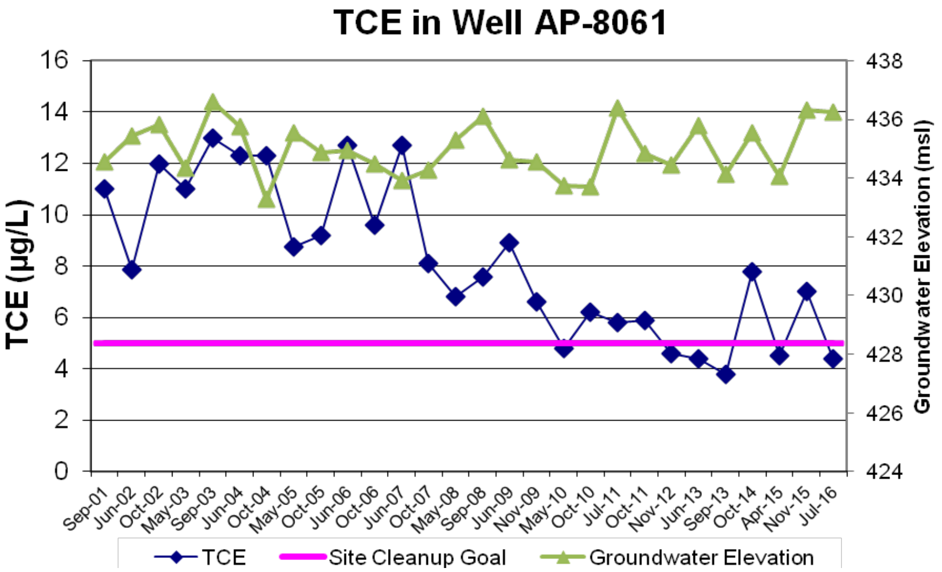


Figure 3-5 Historical Contaminant Concentrations in AP-8061


Benzene in Well AP-8061


TCE in Well AP-8061

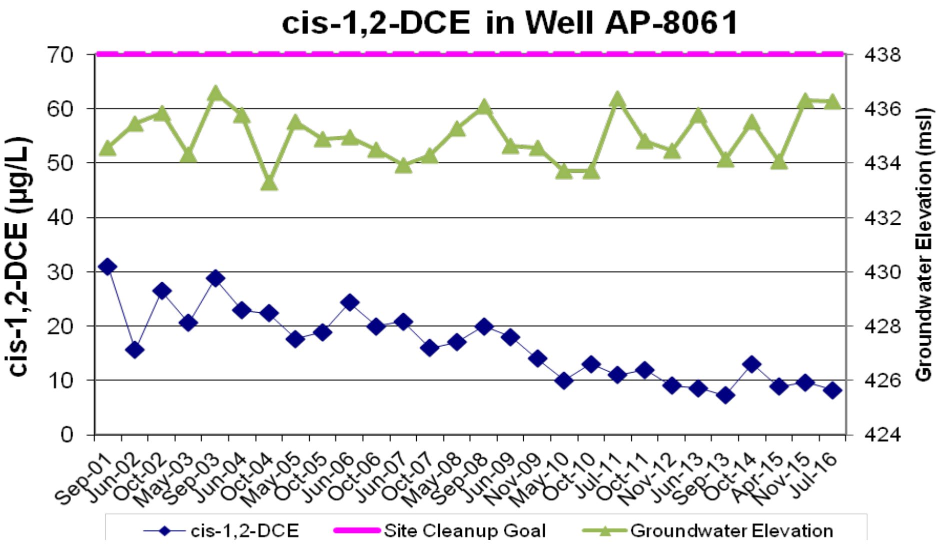
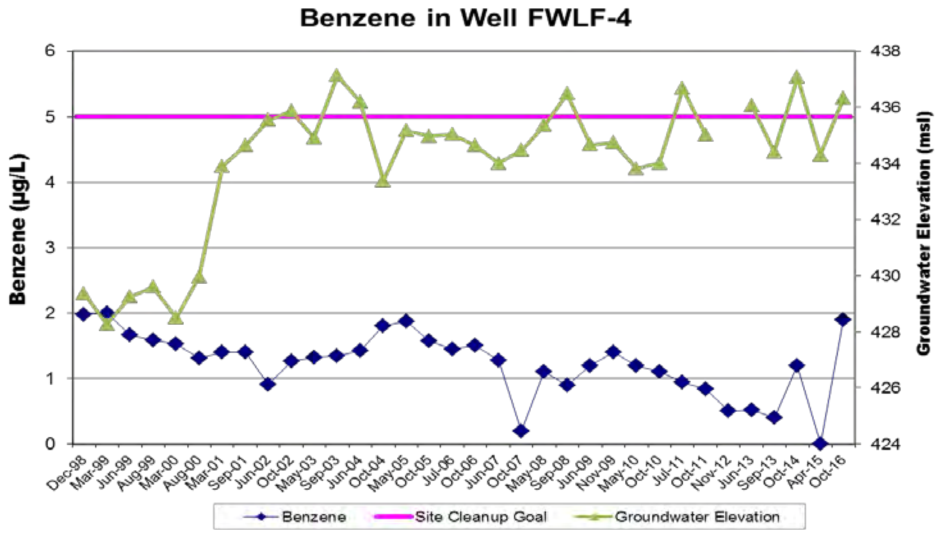
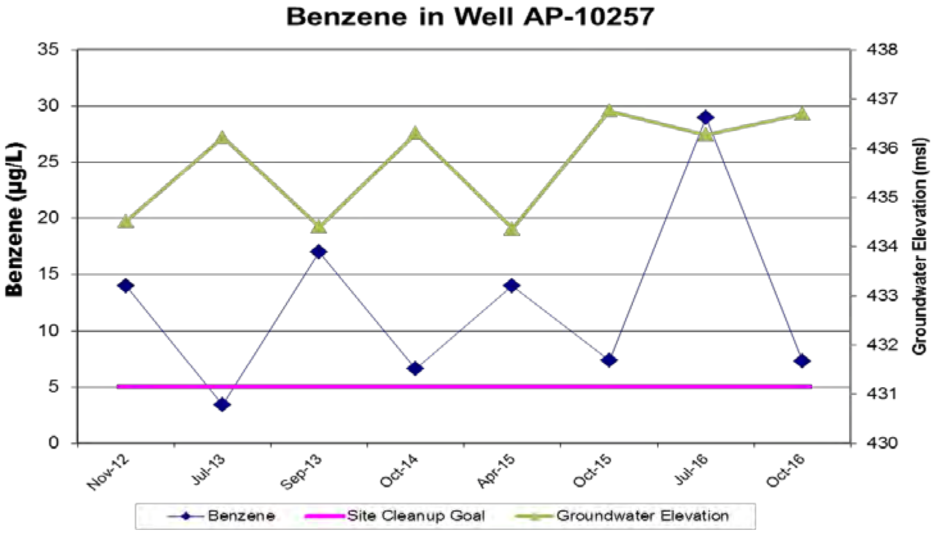

cis-1,2-DCE in Well AP-8061

Figure 3-6 Historical Benzene Concentrations in Upgradient Wells





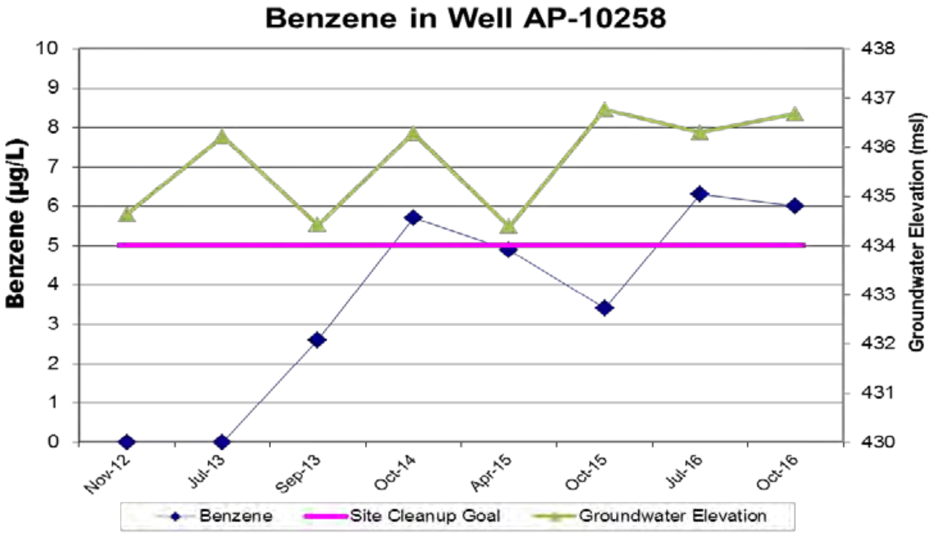
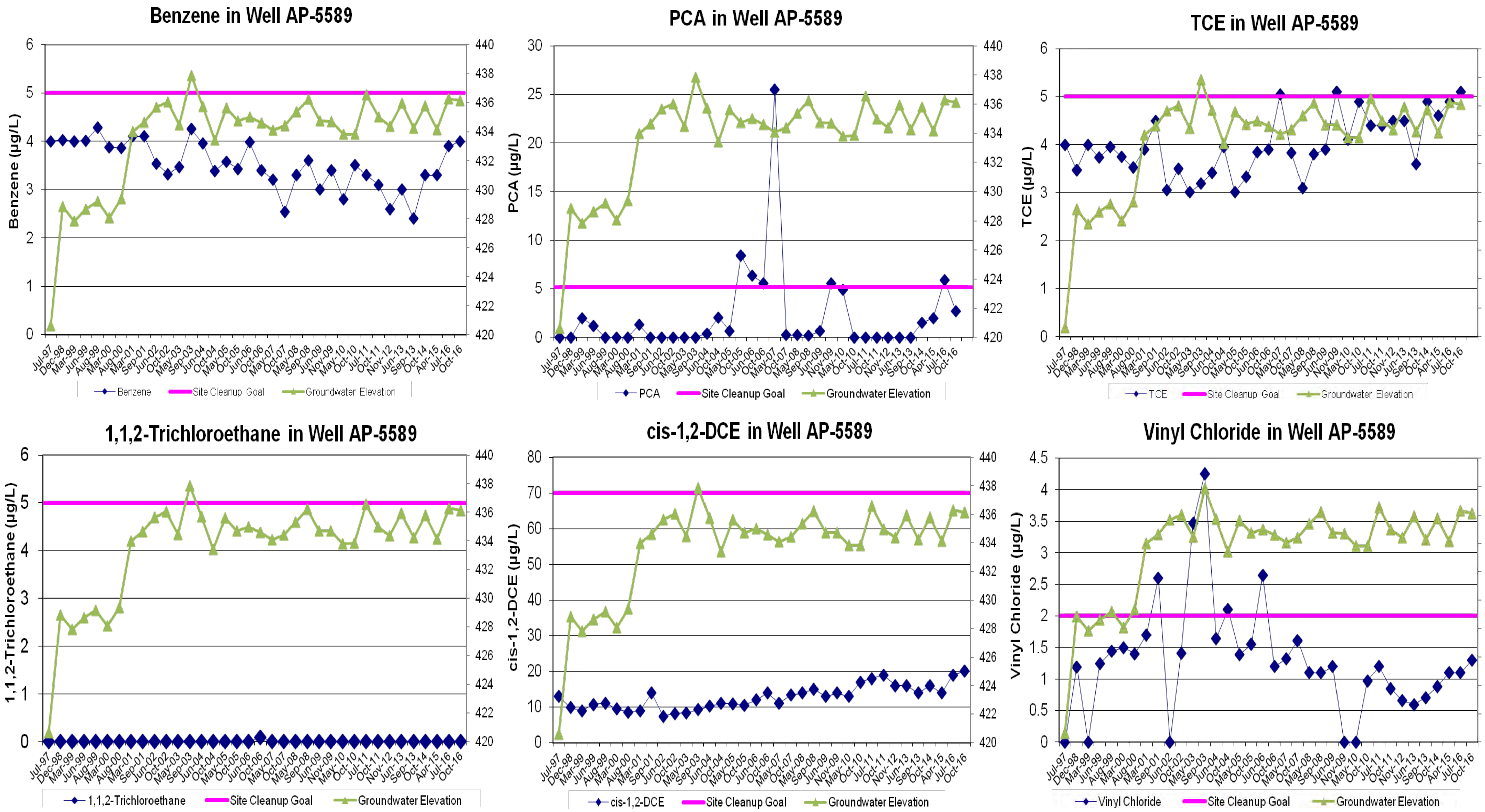


Figure 3-7 Historical Contaminant Concentrations in AP-5589


Benzene in Well AP-5589

PCA in Well AP-5589

TCE in Well AP-5589

1,1,2-Trichloroethane in Well AP-5589

cis-1,2-DCE in Well AP-5589

Vinyl Chloride in Well AP-5589

Figure 3-8 Historical Contaminant Concentrations in AP-8063

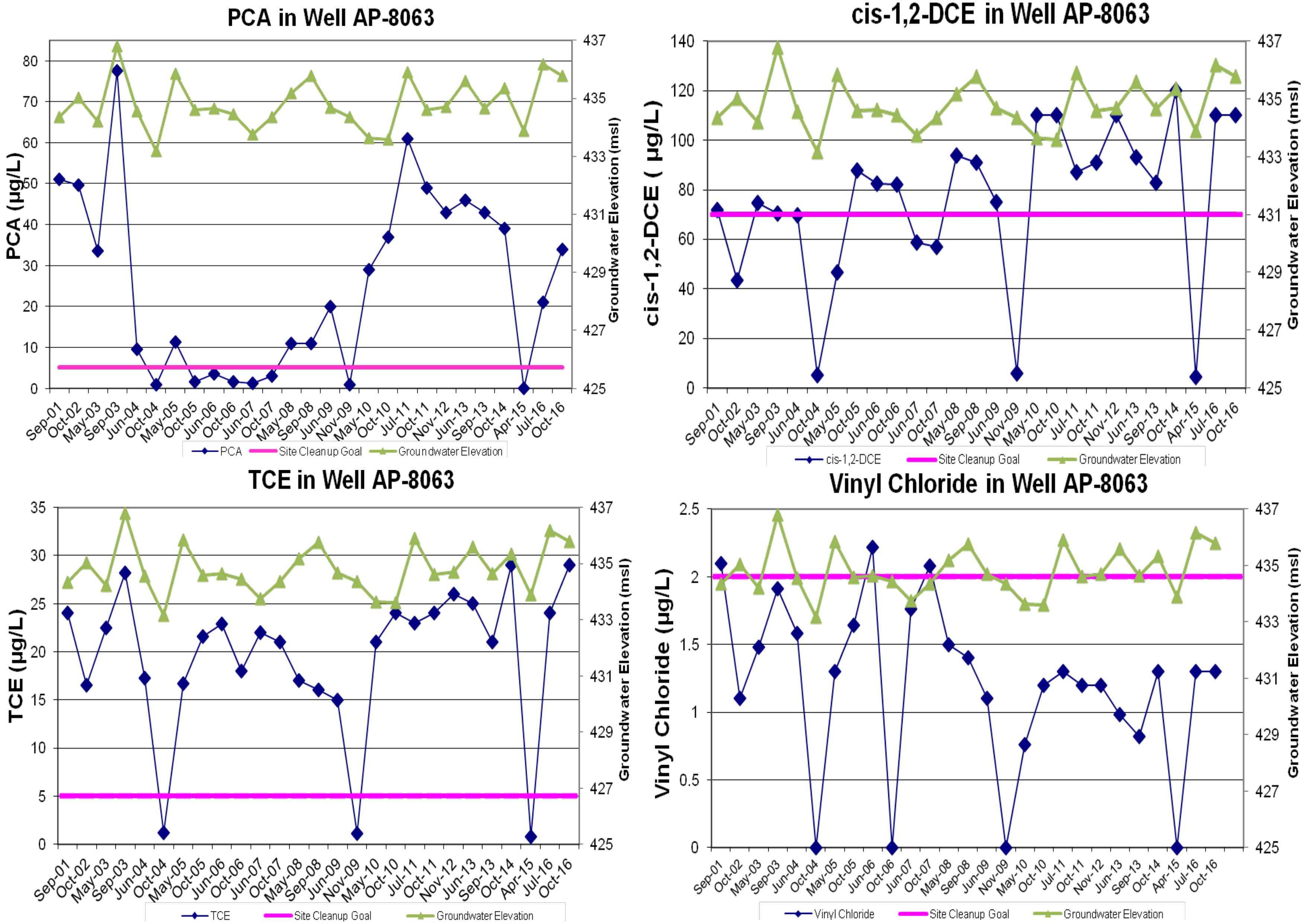


Figure 3-9 Historical Benzene Concentrations in AP-6532 (formerly identified as DH-6534)

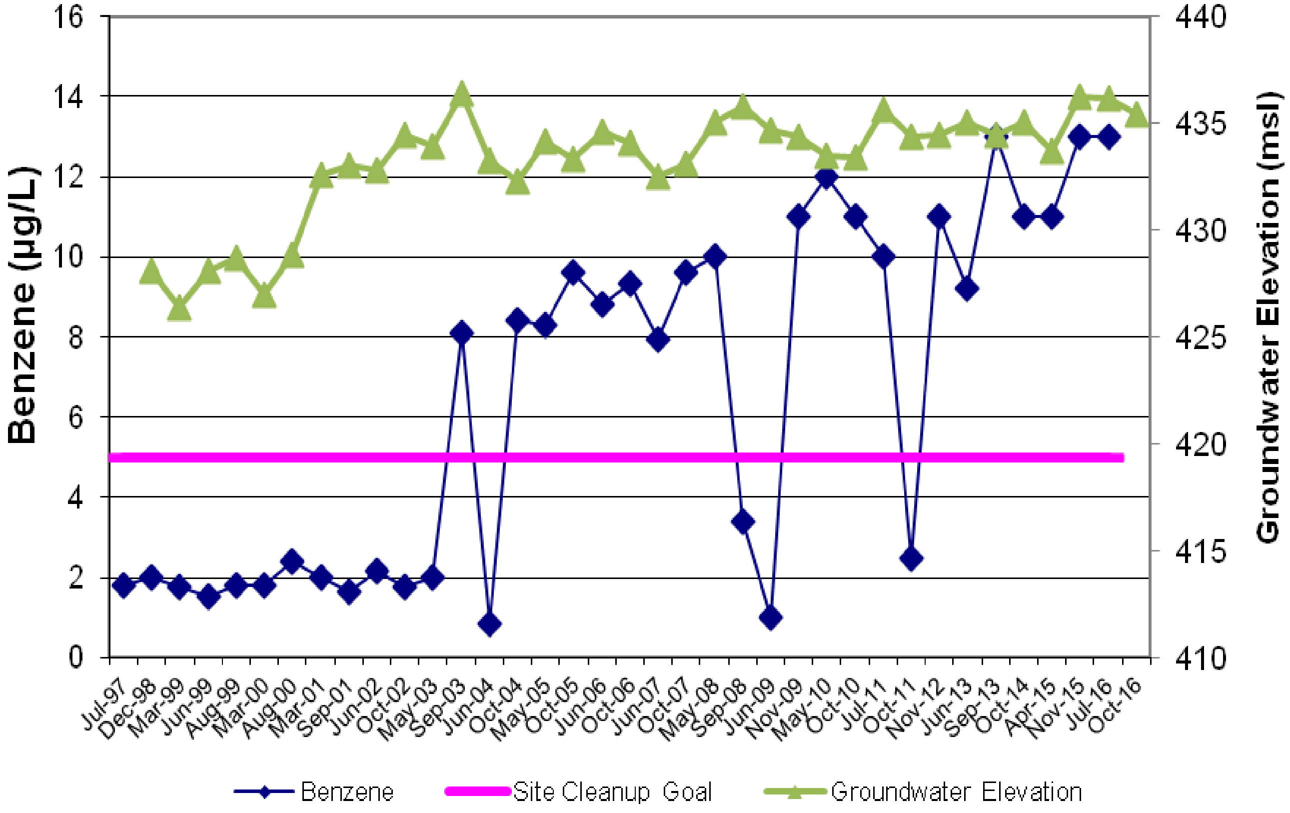
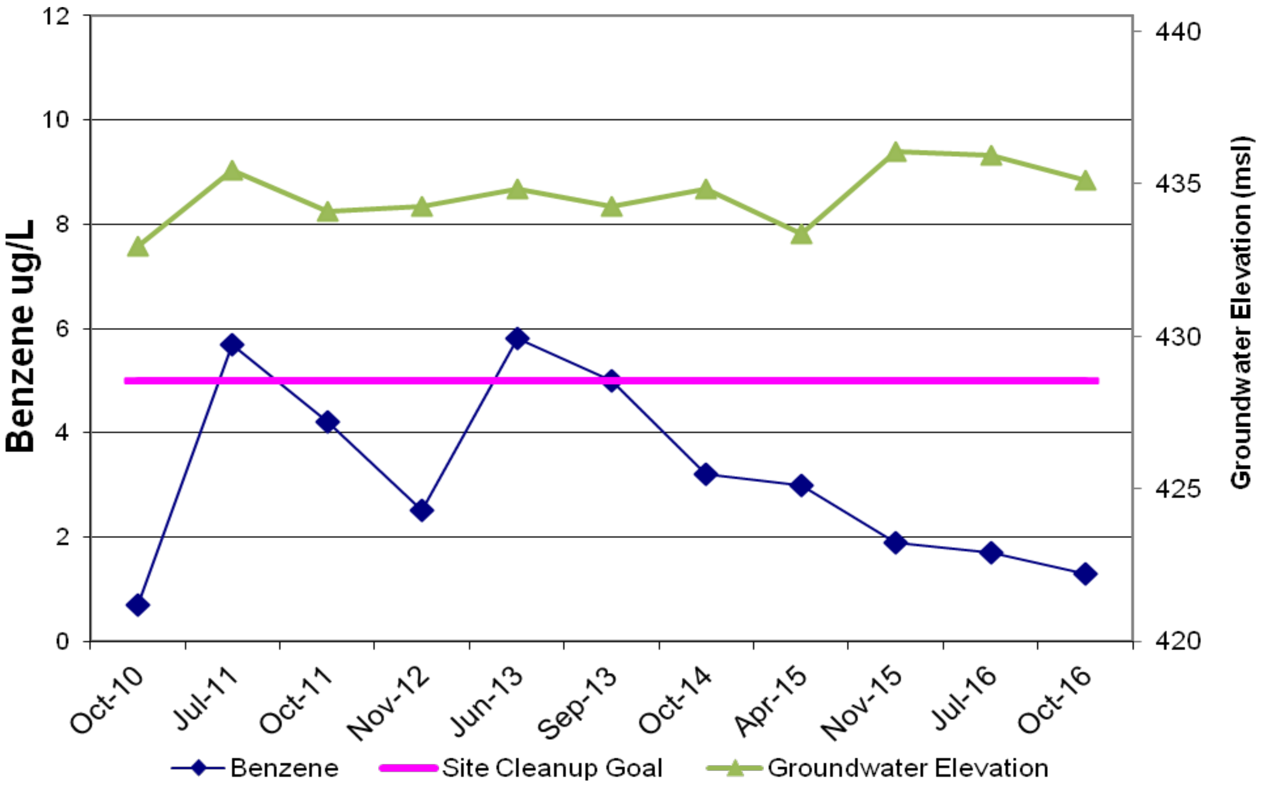
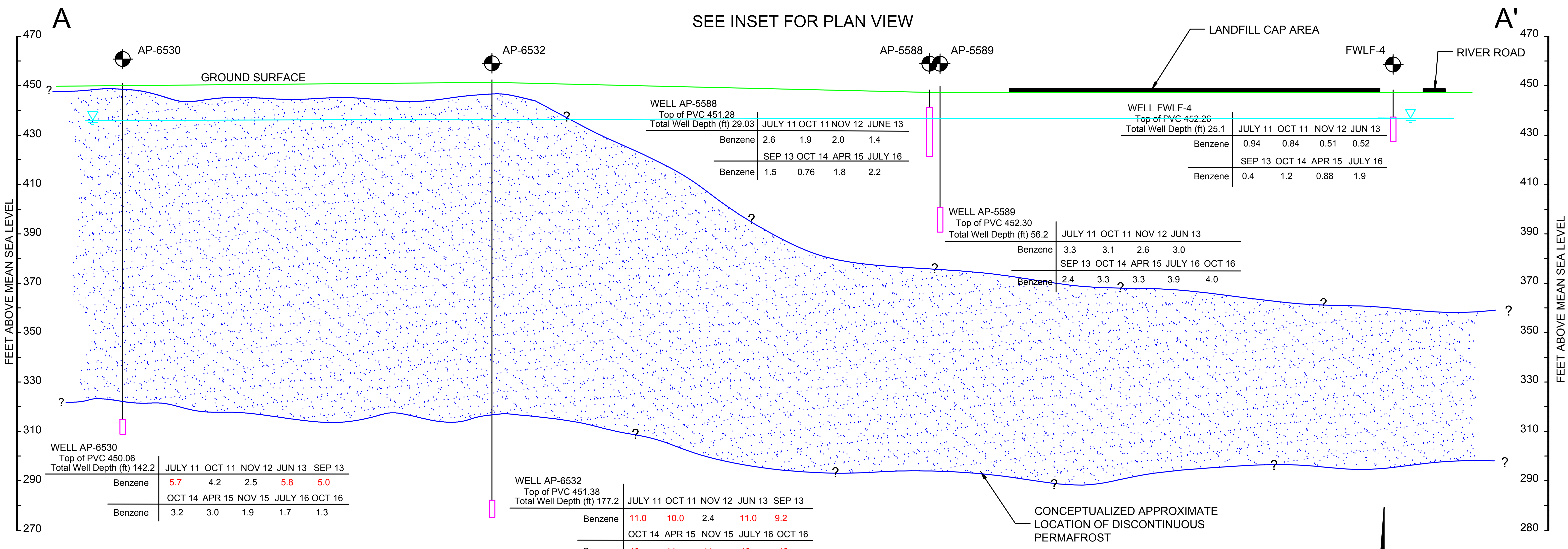


Figure 3-10 Historical Benzene Concentrations in AP-6530





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

	JULY 11	OCT 11	NOV 12	JUN 13	SEP 13
Benzene	5.7	4.2	2.5	5.8	5.0
	OCT 14	APR 15	NOV 15	JULY 16	OCT 16
Benzene	3.2	3.0	1.9	1.7	1.3

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

	JULY 11	OCT 11	NOV 12	JUN 13	SEP 13
Benzene	11.0	10.0	2.4	11.0	9.2
	OCT 14	APR 15	NOV 15	JULY 16	OCT 16
Benzene	13	11	11	13	13

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

	JULY 11	OCT 11	NOV 12	JUNE 13
Benzene	2.6	1.9	2.0	1.4
	SEP 13	OCT 14	APR 15	JULY 16
Benzene	1.5	0.76	1.8	2.2

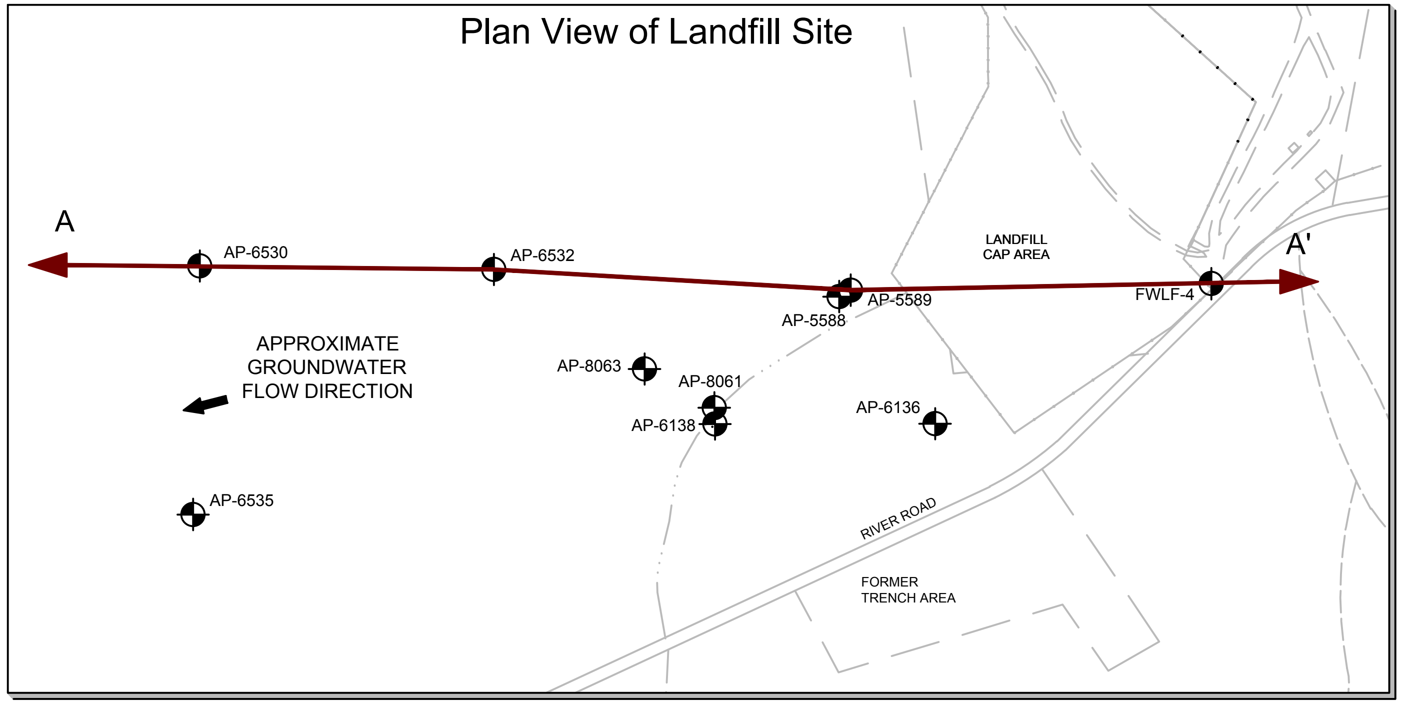
WELL AP-5589
Top of PVC 452.30
Total Well Depth (ft) 56.2

	JULY 11	OCT 11	NOV 12	JUN 13	
Benzene	3.3	3.1	2.6	3.0	
	SEP 13	OCT 14	APR 15	JULY 16	OCT 16
Benzene	2.4	3.3	3.3	3.9	4.0

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

	JULY 11	OCT 11	NOV 12	JUN 13
Benzene	0.94	0.84	0.51	0.52
	SEP 13	OCT 14	APR 15	JULY 16
Benzene	0.4	1.2	0.88	1.9

Plan View of Landfill Site



LEGEND

AP-6532 ⊕	MONITORING WELL
µg/L	MICROGRAMS PER LITER
▯	SCREEN LENGTH
▽	JULY 2016 WATER LEVEL
ND	INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANITATION LIMIT IS STATED IN PARENTHESES.

RAOs IN µg/L

5 Benzene

KEY:

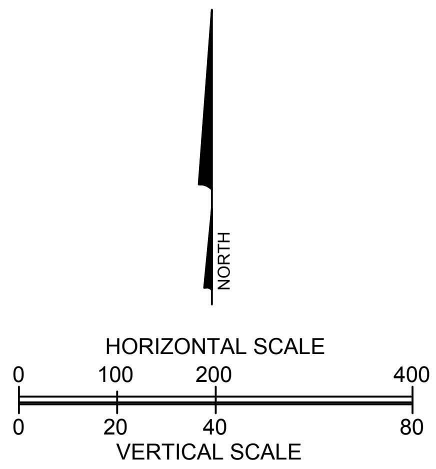
MONITORING WELL

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



HORIZONTAL SCALE
0 100 200 400
0 20 40 80
VERTICAL SCALE

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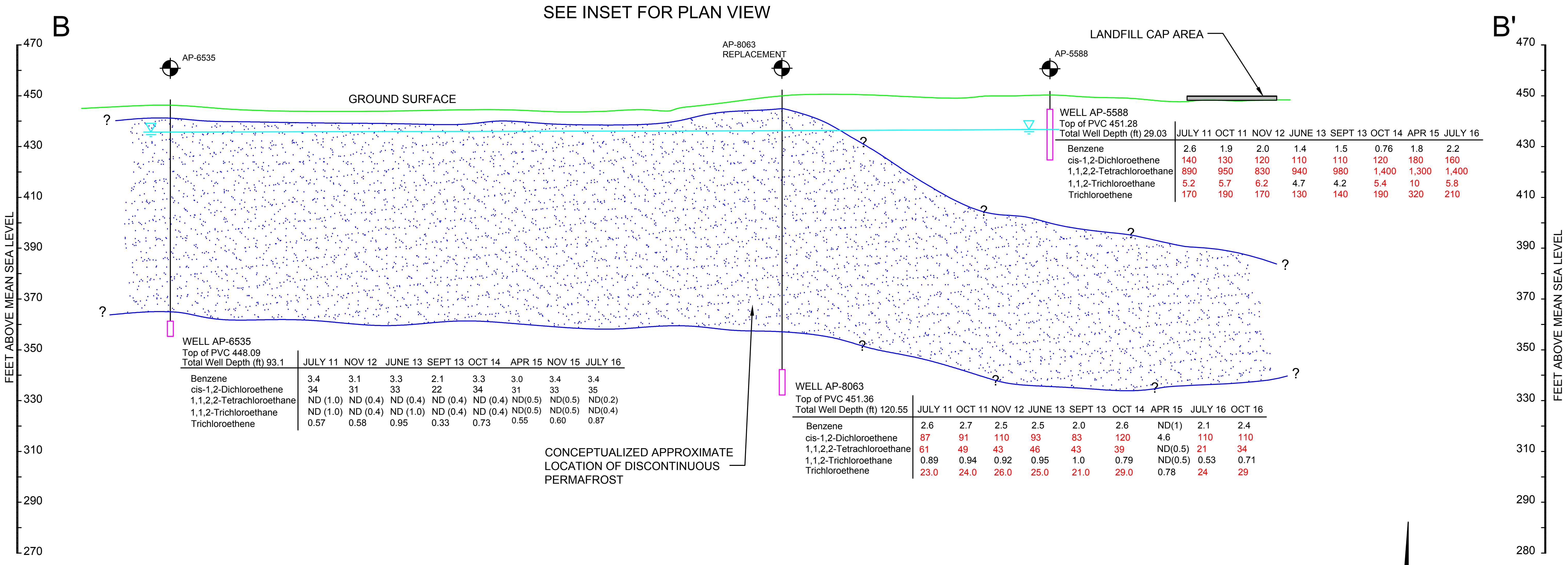
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Cross-Section A-A' View of Benzene Contamination

2016 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-16-D-0005	3-11	11/17



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 14	APR 15	JULY 16
Benzene	2.6	1.9	2.0	1.4	1.5	0.76	1.8	2.2
cis-1,2-Dichloroethene	**140**	**130**	**120**	**110**	**110**	**120**	**180**	**160**
1,1,2,2-Tetrachloroethane	**890**	**950**	**830**	**940**	**980**	**1,400**	**1,300**	**1,400**
1,1,2-Trichloroethane	**5.2**	**5.7**	**6.2**	4.7	4.2	**5.4**	**10**	**5.8**
Trichloroethene	**170**	**190**	**170**	**130**	**140**	**190**	**320**	**210**

WELL AP-6535
Top of PVC 448.09

Total Well Depth (ft) 93.1	JULY 11	NOV 12	JUNE 13	SEPT 13	OCT 14	APR 15	NOV 15	JULY 16
Benzene	3.4	3.1	3.3	2.1	3.3	3.0	3.4	3.4
cis-1,2-Dichloroethene	34	31	33	22	34	31	33	35
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)	ND(0.2)
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)	ND(0.4)
Trichloroethene	0.57	0.58	0.95	0.33	0.73	0.55	0.60	0.87

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 14	APR 15	JULY 16	OCT 16
Benzene	2.6	2.7	2.5	2.5	2.0	2.6	ND(1)	2.1	2.4
cis-1,2-Dichloroethene	**87**	**91**	**110**	**93**	**83**	**120**	4.6	**110**	**110**
1,1,2,2-Tetrachloroethane	**61**	**49**	**43**	**46**	**43**	**39**	ND(0.5)	**21**	**34**
1,1,2-Trichloroethane	0.89	0.94	0.92	0.95	1.0	0.79	ND(0.5)	0.53	0.71
Trichloroethene	**23.0**	**24.0**	**26.0**	**25.0**	**21.0**	**29.0**	0.78	**24**	**29**

LEGEND

AP-6532 ⊕	MONITORING WELL
µg/L	MICROGRAMS PER LITER
▯	SCREEN LENGTH
▽	JULY 2016 WATER LEVEL
ND	INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANTITATION LIMIT IS STATED IN PARENTHESES.

RAOs IN µg/L

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

KEY:

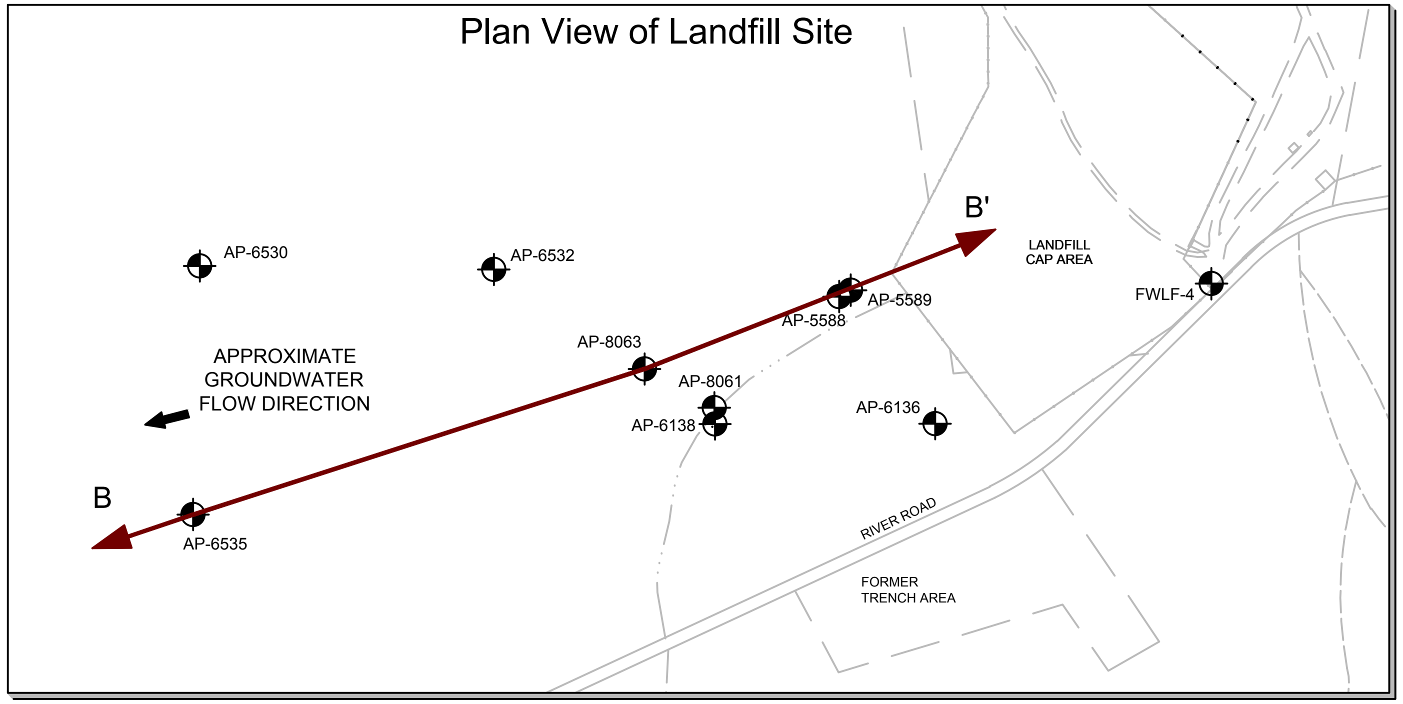
MONITORING WELL
WELL AP-8063
Top of PVC 451.36

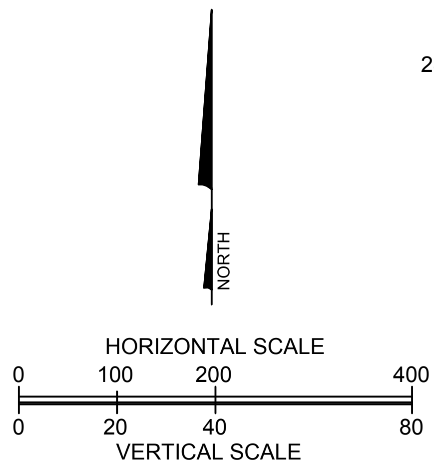
Total Well Depth (ft) 120.55	JULY 11	OCT 11
cis-1,2-Dichloroethene	**87**	**91**
1,1,2,2-Tetrachloroethane	**61**	**49**
1,1,2-Trichloroethane	0.89	0.94
Trichloroethene	**23.0**	**24.0**

CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

Plan View of Landfill Site





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CORPS OF ENGINEERS
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Cross-Section B-B' View of Groundwater Contamination

2016 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-16-D-0005	3-12	11/17

4.0 INSTITUTIONAL CONTROLS INSPECTION

Institutional Controls (IC) site inspections were conducted at the Landfill on multiple days in September and October 2016. The upgradient area that was associated with the former leach field and the Landfill cap and fence were inspected on September 21st, and all wells associated with the Landfill were inspected October 3rd through the 5th. The Landfill cap and fence were observed to be in good condition. All groundwater monitoring wells sampled to monitor site contaminants were found to be in good condition with locking caps. An IC Inspection Form, photographs, and further information pertaining to the Landfill site inspection will be included in 2016 Annual IC Inspection Report (anticipated 2017).

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

- The inactive portions of the Landfill are 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 is recommended at this time.
- 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 and in good condition.
- All wells sampled as part of the Landfill monitoring program are in good condition. Well AP-8061 is slightly frost jacked; however, no significant change was noticed compared to the 2015 IC inspection. All wells were locked. In addition, over 100 wells associated with the Landfill, but no longer sampled, were located and inspected. The Army is beginning planning for a basewide decommissioning effort under a separate contract for wells that are no longer sampled. Minor incidences of well caps/expansion plugs and locks that required replacing were noted. Additional information about specific wells can be found in the 2016 Annual IC Inspection Report (anticipated 2017).

5.0 CONCLUSIONS AND RECOMMENDATIONS

The monitoring data collected during the 2016 sampling events was generally consistent with results detected during previous sampling events. 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, where 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 two shallow upgradient wells (AP-10257 and AP -10258) 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 COC concentrations fluctuate, overall the COCs are showing a 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.

FWLF-4 – 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. Other than benzene and cis-1,2-DCE detected below the RAG, no other COC are detected in this well. It is suspected that the low levels of COC detected in FWLF-4 are from the active landfill as this well is upgradient of the closed and capped portion of the Landfill. The sample frequency at this well was reduced to annual spring sampling in 2015 due to consistently low levels of COC detected in this well since 1998.

AP-8061 – This shallow well is located within a thaw channel downgradient of the Landfill. Benzene and TCE have been 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. In 28 sampling events, benzene has been detected 13 times, with 5.8 µg/L being the highest benzene concentration detected in this well. Benzene was most recently detected above the RAG in 2015. TCE and 1,2-DCE are the only chlorinated COCs detected in this well. Cis-1,2-DCE is consistently detected well below the RAG. Overall TCE is showing a decreasing trend; although, it increased to above the RAG during the fall 2015 sampling event. This well will be sampled during the spring and fall 2017 to monitor potential downgradient migration of COCs.

AP-10257 and AP-10258 – Benzene has been detected above the RAG in seven of the eight sampling events at AP-10257 with the highest concentration detected in 2016 at 29 µg/L. Benzene was detected above the RAG in AP-10258 during 2014 and again during both 2016 sampling events. Cis-1,2-DCE is also consistently detected in both wells at concentrations well below the RAG. It is suspected that the COCs detected in AP-10257 and AP-10258 are from the active landfill as these wells are upgradient of the closed and capped portion of the Landfill. These wells will continue to be sampled during the spring and fall of 2017 to monitor the presence of benzene upgradient of the closed portion of the Landfill.

Intermediate Well (screened below the groundwater table but above permafrost)

One intermediate well, AP-5589, continues to be sampled as part the Landfill source area sampling program. The following summarizes the recommendations for this intermediate well:

AP-5589 – 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 and spring of 2016; vinyl chloride which has been detected above the RAG during four sampling events, but has been below the RAG since 2006; and, TCE which was detected at the RAG during the spring 2007, fall 2009, and fall 2016 sampling events. Bis(2-ethylhexyl) phthalate has only been detected above the RAG one time in this well, during June 2013. In 2014, the sample frequency at this well was reduced to annual spring sampling to coincide with spring sampling at AP-5588; however, due to an error in the 2016 Post Wide Work Plan, this well was sampled twice in 2016.

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 downgradient wells at the Landfill source area:

AP-8063 – While benzene has consistently been detected below the RAG in this well, it has never exceeded the RAG; however chlorinated solvents TCE, PCA and cis-1,2,-DCE are consistently detected above RAGs in AP-8063. TCE decreased between 2001 and 2009; however overall, concentrations of TCE have been increasing since spring 2010. 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) the sampling frequency at AP-8063 return to biannually. This well will continue to be sampled during the spring and fall of 2017 to monitor downgradient migration of contaminants.

AP-6535 – Benzene has been 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. However, it is recommended that reducing the sampling frequency for this well to annual sampling for the 2018 field season be considered.

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 2016 sampling events in AP-6532 and benzene appears to exhibit an overall increasing trend in this well. Benzene was below the RAG in downgradient well AP-6530 in 2016 and benzene has decreased during each sampling event at AP-6530 since spring 2013. 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**		

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

Institutional Control Survey

An annual inspection of the capped section of the Fort Wainwright Landfill should continue to 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).

6.0 REFERENCES

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[DOWL/Odgen] DOWL/Odgen Joint Venture, 2002. *2001 Annual Groundwater Sampling Report, Operable Unit 4.* Fort Wainwright, Alaska. May.

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APPENDIX A

GROUNDWATER SAMPLING FORMS, GROUNDWATER FIELD MEASUREMENTS, AND FIELD FORMS

YSI AND TURBIDIMETER CALIBRATION FORM

Operable Unit 4

Name: MB / SK / CB

Calibration Liquid Lot Numbers/ Expiration Dates:

SPC
/

ORP
/

Ph 4
/

Ph 7 or Ph 10
/

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)
7/11/16	OU4	6/12	762.6	9.25	8.69	0.996	1.000	228.9	240	4.17	4.00	6.93	7.00	Y
7/11/16	Landfill	6/12	764.3	8.61	8.78	1.007	1.000	241.5	240.0	4.14	4.00	6.93	7.00	Y
"	"	5/14	764.4	8.82	8.75	1.053	1.000	225.4	240.0	4.05	4.00	7.03	7.00	Y
7/12/16	OU4	7	764.7	20.04	8.80*	0.983	1.000	196.1	240.0	4.33	4.00	6.90	7.00	NA
"	"	8/13	762.1	20.07	8.72	1.009	1.000	226	240	4.05	4	7.21	7	Y
10/17/16	OU4	6/14	747.8	10.23	9.48	1.001	1.000	239.1	240.0	3.95	4.00	6.98	7.00	Y
10/18/16	OU4	6/14	750.9	8.73	9.26	1.002	1.000	242.9	240.0	3.98	4.00	6.96	7.00	Y

Notes/ Maintenance Items: * UNStable - Changed membrane 3.30 → 9.00 mg/L

GROUNDWATER SAMPLE FORM OU4 **Ft. Wainwright, Alaska**

Project #: 9003-05
Site Location: Landfill / CAT Shed
Date: 7-11-16
Probe/Well #: AP-10257MW
Time: MB ~~1015~~ 1000
Sample ID: 16FWOU4 01 WG
Sampler: MB
Weather: OVERCAST
Outside Temperature: 60°F
AP-5050
QA/QC Sample ID/Time/LOCID: FIELD DUP 16FWOU402WG "1100"
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 #: 12 Water Level: 9 SOLINST 200'

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

Column of Water in Probe/Well
Sampling Depth verified w/CB
Total Depth in Probe/Well (feet btoc): 24.5
Well Screened [✓ Across] / ~~Below~~ water table
Depth to Water from TOC (feet): - 17.73
Depth tubing / pump intake set* approx. 18.4 feet below top of casing
Column of Water in Probe/Well (feet): = 6.77
*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): 1.1

Start 1000

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)
0.75	5	3.17	0.745	3.12	3.80	157.5	66.33	17.74
1.25	10	5.15	0.724	1.27	3.97	138.9	51.54	17.74
1.75	15	4.49	0.737	1.12	5.24	66.4	31.39	17.74
2.25	20	4.91	0.736	1.01	5.04	74.3	20.72	17.74
2.75	25	5.26	0.735	0.81	5.42	53.3	9.31	17.74
2.15	30	5.18	0.732	0.59	5.30	59.2	6.90	17.74
2.75	35	5.38	0.731	0.54	5.40	45.5	5.31	17.74
3.25	40	6.43	0.729	0.52	5.77	33.2	5.14	17.74
3.75	45	6.85	0.730	0.47	5.99	21.2	5.34	17.74
4.25	50	5.38	0.732	0.39	5.85	29.3	4.27	17.74
4.75	55	5.51	0.731	0.41	5.80	30.3	4.01	17.74
5.25	60	5.56	0.732	0.38	5.86	27.6	4.87	17.74

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: ORANGE INITIALLY
Well Condition: Lock [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments: GOOD - STICKUP
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane]
pH checked of samples: Y / [✓ N] Approximate volume added (mL): HCl = ______ HNO₃ = ______ NO DRO

Purge Water
Gallons generated: 5.25 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: MB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05
Date: 7-11-16
Time: 1230
Sampler: MB
Weather: overcast
QA/QC Sample ID/Time/LOCID:

Site Location: Landfill / CAT Shed
Probe/Well #: AP-10258MW
Sample ID: 16FWOU4 03 WG
Outside Temperature: 65°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 #: 12 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): 23.8
Depth to Water from TOC (feet): - 17.24
Column of Water in Probe/Well (feet): = 6.56
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): 1.1

Sampling Depth

Well Screened [✓ Across] / Below water table 18'
Depth tubing / pump intake set* approx. 18 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

Start 1145

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)
1	10	3.90	0.617	0.74	6.00	74.0	8.12	17.25
1.5	15	4.58	0.626	0.51	6.01	73.7	4.94	17.25
2	20	4.88	0.630	0.44	6.03	73.1	4.61	17.25
2.5	25	4.92	0.634	0.43	6.04	73.4	3.22	17.25
3	30	5.32	0.647	0.48	5.94	80.8	2.93	17.26
3.5	35	5.28	0.643	0.37	6.02	75.3	2.03	17.26
4	40	5.20	0.647	0.31	6.03	75.5	2.22	17.26
4.5	45	5.14	0.652	0.29	6.01	80.6	1.93	17.26

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane]

pH checked of samples: Y / [✓ N] ~~Approximate volume added~~ (mL): HCl = ____ HNO_3 = ____

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: MB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05

Date: 7-11-16

Time: 1400

Sampler: MB

Weather: OVERCAST

QA/QC Sample ID/Time/LOCID: —

Site Location: Landfill / CAT Shed (FWLF4)

Probe/Well #: FWLF-4 (AP-5943) ON TAG

Sample ID: 16FWOU4 04 WG

Outside Temperature: 70°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 #~~ 10 Turbidity Meter #: 12 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): 25.1

Depth to Water from TOC (feet): - 15.90

Column of Water in Probe/Well (feet): = 9.2

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): 1.5

Sampling Depth

Well Screened [✓ Across] / Below water table

Depth tubing / pump intake set* approx. 17 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

Start 1320

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)
1	10	4.61	0.696	0.92	6.24	21.1	61.38	16.54
1.5	15	5.34	0.704	1.09	6.27	2.0	36.47	16.26
2	20	655	0.689	0.68	6.38	-12.2	15.88	16.16
2.5	25	5.69	0.708	0.92	6.45	-16.5	13.01	16.03
3	30	7.01	0.718	0.88	6.48	-23.4	9.91	16.08
3.5	35	7.23	0.714	0.92	6.48	-24.6	10.51	16.04
4	40	7.16	0.720	0.96	6.50	-26.2	8.96	16.06
4.5	45	7.07	0.722	0.99	6.44	-21.7	7.82	16.08

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] INITIALLY 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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane,]

pH checked of samples: Y / [✓ N] ~~Approximate volume added~~ (mL): HCl = ______ HNO_3 = ______

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: MB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05
Date: 7-11-16
Time: 1700
Sampler: MB
Weather: SUNNY
QA/QC Sample ID/Time/LOCID: —

Site Location: Landfill / CAT Shed
Probe/Well #: AP-8061
Sample ID: 16FWOU4 05 WG
Outside Temperature: 75°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 #: 12 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): 25.3
Depth to Water from TOC (feet): - 7.87
Column of Water in Probe/Well (feet): = 17.43
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): 2.84

Start 1540

Sampling Depth 8' screened 7.8-22.8' btoc
Well Screened [✓ Across] / ~~[✓ Below]~~ water table
Depth tubing / pump intake set* approx. 20' 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)
1	10	2.42	0.691	1.10	5.92	-38.2	113.7	7.87
1.5	15	1.93	0.691	0.72	5.99	-45.0	95.15	7.88
2	20	1.91	0.691	0.62	6.11	-52.0	90.03	7.88
2.5	25	1.70	0.692	0.51	6.18	-56.8	75.54	7.88
3	30	1.77	0.691	0.39	6.18	-58.3	62.60	7.58
3.5	35	1.77	0.691	0.32	6.22	-62.9	36.25	7.88
4	40	1.78	0.690	0.30	6.23	-64.9	36.54	7.88

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] INITIALLY 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: Jacked up Lid
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane]
pH checked of samples: Y/ [✓ N] Approximate volume added (mL): HCl = ______ HNO_3 = ______

Purge Water
Gallons generated: 4.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: MB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05
Site Location: Landfill / CAT Shed
Date: 7-12-16
Probe/Well #: AP-6530
Time: 1145
Sample ID: 16FWOU4 06 WG
Sampler: MB
Weather: Sunny
Outside Temperature: 65°F – 70°F
QA/QC Sample ID/Time/LOCID: Mega Monsoon #241/03
MS/MSD Performed? Yes/ No

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

Equipment Used for Sampling: YSI # 10 Turbidity Meter #: 12 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): 137.8
Depth to Water from TOC (feet): - 14.13
Column of Water in Probe/Well (feet): = 123.07
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): 20.2

Start 1050

Sampling Depth

Well Screened Across / [✓ Below] water table
Depth tubing / pump intake set* approx. 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 O₂ (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1	10	3.05	0.358	2.50	3.81	82.4	14.13	28.85
1.5	15	2.80	0.434	2.03	4.72	25.8	27.60	14.13
2	20	3.57	0.463	1.52	5.09	2.7	25.22	14.13
2.5	25	2.85	0.371	1.19	5.72	-26.2	16.81	14.13
3	30	3.19	0.451	0.92	5.90	-39.3	16.36	14.13
3.5	35	2.79	0.464	0.74	5.87	-41.3	14.51	14.13
4	40	3.09	0.469	0.64	6.23	-61.0	12.99	14.13
4.5	45	3.21	0.470	0.58	6.20	-59.5	8.03	14.13
5	50	3.28	0.471	0.55	6.25	-62.7	5.92	14.13

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: BLK INITIALLY FINE SILTS
Well Condition: Lock [✓ Y] N Labeled with LOC ID [✓ Y] N Comments:
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:
[✓ * Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn]
Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane]
pH checked of samples: Y [✓ N] Approximate volume added (mL): HCl = ______ HNO₃ = ______

Purge Water

Gallons generated: 5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: MB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05

Date: 7-12-16

Time: 1430

Sampler: MB

Weather: Sunny

QA/QC Sample ID/Time/LOCID: —

Site Location: Landfill / CAT Shed

Probe/Well #: AP-6535

Sample ID: 16FWOU4 07 WG

Outside Temperature: 75°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 #:** 12 **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): 90.9

Depth to Water from TOC (feet): - 12.41

Column of Water in Probe/Well (feet): = 78.49

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

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

Start 1740

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)
1	10	5.27	0.402	2.70	6.03	-11.6	127.5	12.50
1.5	15	4.18	0.426	1.64	5.98	-15.9	107.1	12.49
2	20	5.30	0.432	1.37	6.09	-27.4	95.64	12.47
2.5	25	4.00	0.436	1.12	6.29	-35.4	78.95	12.48
3	30	3.96	0.441	0.65	6.02	-24.3	79.84	12.48
3.5	35	3.94	0.446	0.55	6.15	-34.3	74.33	12.48
4	40	3.85	0.449	0.56	6.13	-34.0	70.95	12.49

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane]

pH checked of samples: Y / [✓ N] Approximate volume added (mL): HCl = ____ HNO_3 = ____

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? Yes / No If No, why not?

Sampler's Initials: MB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM

OU4

Ft. Wainwright, Alaska

Project #: 9003-05

Date: 7/12/16

Time: 1350

Sampler: JK/CB

Weather: Clear

Site Location: Landfill / CAT Shed

Probe/Well #: AP-5589

Sample ID: 16FWOU4 08 WG

Outside Temperature: 73 °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 # 5 Turbidity Meter #: 14

Water Level: 50.13

Free Product Observed in Probe/Well? Yes / [✓ No]

If Yes, Depth to Product: —

Column of Water in Probe/Well

Sampling Depth 10'screen

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

Well Screened Across [✓ Below] water table

Depth to Water from TOC (feet): - 15.85

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

Column of Water in Probe/Well (feet): = 40.47

*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): 6.6

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 O₂ (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	4.49	0.836	2.49	6.58	-16.2	12.09	15.86
1.0	10	3.48	0.889	1.23	6.23	-15.2	5.16	15.86
1.5	15	3.34	0.903	0.94	6.25	-19.0	7.90	15.86
2.0	20	3.38	0.920	0.81	6.43	-31.7	4.56	15.86
2.5	25	3.56	0.915	0.71	6.44	-32.9	3.90	15.86
3.0	30	3.60	0.914	0.69	6.51	-45.5	3.76	15.86
3.5	~~40~~ 35	3.57	0.914	0.65	6.60	-50.4	2.89	15.86
4.0	~~45~~ 40	3.63	0.915	0.67	6.61	-53.1	2.50	15.86
4.5	45	3.07	0.915	0.66	6.63	-55.0	2.51	15.86
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: Lock [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments:

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

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane,]

pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = ______ HNO₃ = 0

Purge Water

Gallons generated: 5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: CB Disposal method: [✓ FWA IDW treatment facility] / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05
Date: 7/12/16
Time: 1600
Sampler: CB
Weather: MOSTLY SUNNY
QA/QC Sample ID/Time/LOCID: 16FWOU410WG/1620/ AP-6060 + RINSATE AT 1835 16FWOU413WG

Site Location: Landfill / CAT Shed
Probe/Well #: AP-6532
Sample ID: 16FWOU4 09 WG
Outside Temperature: 79°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 # 7 Turbidity Meter #: 13 Water Level: 10

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): - 1498
Column of Water in Probe/Well (feet): = 158.80
Circle: Gallons per foot of 1.25" (X 0.054) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 25.88

Sampling Depth

Well Screened Across / [✓ Below] water table 6' SCREEN
Depth tubing / pump intake set* approx. 176.7 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)
0.5	5	2.10	0.301	3.94	5.50	1639	94.47	15.05
1.0	10	2.28	0.358	2.90	5.51	154.0	78.92	15.05
1.5	15	2.25	0.377	2.60	5.57	146.9	61.84	15.05
2.0	20	1.84	0.396	~~2~~ 1.05	5.57	144.1	36.45	15.05
2.5	25	1.97	0.405	0.84	5.77	132.6	22.36	15.05
3.0	30	2.00	0.409	0.67	5.85	126.6	13.89	15.05
3.5	35	1.82	0.411	0.39	5.97	120.6	10.96	15.05
4.0	40	1.78	0.413	0.42	5.99	118.7	7.21	15.05
4.5	45	1.75	0.414	0.43	6.01	115.1	7.56	15.05
5	50	1.72	0.414	0.40	6.01	112.7	4.39	15.05
5.5	55	1.69	0.415	0.39	6.02	111.7	4.52	15.06
6	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: RAN GENERATOR/ HEAT
Sheen: Yes / [✓ No] Odor: Yes / [✓ No]
Notes/Comments: TRACE ON WELL FOR 4 DAYS TO THAW WELL.
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn.
Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane,]
pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = ______ HNO_3 = 0

Purge Water

Gallons generated: 6 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: CB Disposal method: [✓ FWA IDW treatment facility] / Emerald Environmental/GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05

Date: 7/12/16

Time: 1720

Sampler: JK

Weather: Clear

Site Location: [✓ Landfill] / CAT Shed

Probe/Well #: AP-5588

Sample ID: 16FWOU4 11 WG

Outside Temperature: 80°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 # 5 Turbidity Meter #: 14

Water Level: SOL13

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

Well broken bgs unable to get Sub pump in well. 20' screen

Column of Water in Probe/Well

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

Depth to Water from TOC (feet): - 14.87

Column of Water in Probe/Well (feet): = 14.25

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): 2.3

Sampling Depth

Well Screened [✓ Across] / ~~Below~~ water table

Depth tubing / pump intake set* approx. 15 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

* Dedicated Tubing

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)
0.5	5	2.49	1.269	1.53	5.16	8.5	40.42	14.90
1.0	10	2.51	1.269	1.04	5.38	-3.9	27.55	14.91
1.5	15	2.54	1.262	0.81	5.45	-10.0	17.65	14.91
2.0	20	2.51	1.267	0.70	5.57	-18.3	15.59	14.91
2.5	25	2.53	1.262	0.72	5.62	-22.3	15.41	14.91
3.0	30	2.51 ✓	1.261 ✓	0.62 ✓	5.77 x	-31.3 x	12.24	14.91
3.5	35	2.50	1.258	0.58	5.76	-30.0	13.96	14.91
4.0	40	2.57	1.250	0.56	5.80	-35.4	17.62	14.91

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ Total Metals*], [✓ Iron], [✓ Sulfate], [✓ Methane]

pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = ______ HNO₃ = Ø

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's Initials: JK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05
Site Location: Landfill / CAT Shed
Date: 7/12/16
Probe/Well #: AP-8063
Time: 1800
Sample ID: 16FWOU4 12 WG
Sampler: MB
Weather: Sunny - Hot
Outside Temperature: 80°F
QA/QC Sample ID/Time/LOCID: Submersible won't fit
MS/MSD Performed? Yes/ No

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

Equipment Used for Sampling: YSI # 7 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): 121.8
Depth to Water from TOC (feet): - 15.04
Column of Water in Probe/Well (feet): = 106.76
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): 17.4

Sampling Depth
Well Screened Across / [✓ Below] water table
Depth tubing / pump intake set* approx. 116 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)
1	10	2.73	0.526	4.15	5.24	246.6	6.65	15.08
1.5	15	2.72	0.836	3.00	5.57	234.1	3.91	15.08
2	20	2.58	0.869	2.25	5.89	213.9	4.36	15.08
2.5	25	2.69	0.873	1.72	6.11	199.6	10.45	15.08
3	30	2.78	0.872	1.67	6.26	1886	10.80	15.08
3.5	35	2.80	0.873	1.60	6.33	183.7	8.60	15.08
4	40	2.72	0.860	1.58	6.34	176.4	6.99	15.08

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: SLIGHT
Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): [✓ VOC, SVOC, Total Metals*, Iron, Sulfate, Methane]
pH checked of samples: Y / [✓ N] Approximate volume added (mL): HCl = ____ HNO_3 = ____

Purge Water
Gallons generated: 4 Containerized and disposed as IDW? [✓ Yes] /No If No, why not?
Sampler's Initials: MB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM

OU4 Ft. Wainwright, Alaska

Project #: 9003-05
Date: 10/17/16
Time: 1400
Sampler: SK
Weather: Cloudy / Windy
QA/QC Sample ID/Time/LOCID:

Site Location: Landfill / CAT Shed
Probe/Well #: AP-6532
Sample ID: 16FWOU4 15 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 #: 14 Water Level: 5069

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): - 15.72
Column of Water in Probe/Well (feet): = 157.98
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): 25.7

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.

			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)
0.5	5	6.57	0.298	2.73	5.65	82.4	76.93	15.74
1.0	10	6.33	0.336	1.64	6.02	59.7	75.95	15.74
1.5	15	6.00	0.370	1.24	6.02	54.0	27.56	15.74
2.0	20	6.02	0.392	0.88	5.93	48.1	24.81	15.74
2.5	25	5.57	0.395	0.76	5.91	43.6	10.55	15.74
3.0	30	5.35	0.400	0.65	5.91	45.1	9.11	15.74
3.5	35	5.74 ✓	0.402 ✓	0.61 ✓	5.92 ✓	43.1 ✓	8.41 X	15.74

SK

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: During initial purging
Well Condition: Lock [✓ Y] / N Labeled with LOC ID: [✓ Y] / N Comments:
Sheen: Yes [✓ No] Odor: Yes [✓ No] Notes/Comments:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ Total Metals*], [✓ Iron], [✓ Sulfate], [✓ Methane],
pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = NA HNO₃ = 0

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: SK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 **Ft. Wainwright, Alaska**

Project #: 9003-05

Date: 10/17/16

Time: 1545

Sampler: JK

Weather: Cloudy /windy

QA/QC Sample ID/Time/LOCID:

Site Location: Landfill / CAT Shed

Probe/Well #: AP-6530

Sample ID: 16FWOU4 16 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 #: 14

Water Level: SDL 9

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

Column of Water in Probe/Well

Sampling Depth 6' screen

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

Well Screened Across / [✓ Below] water table

Depth to Water from TOC (feet): - 14.93

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

Column of Water in Probe/Well (feet): = 124.23

*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): 20.2

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)
0.5	5	2.09	0.454	1.23	5.74	323	12.99	14.95
1.0	10	1.80	0.470	0.71	6.01	7.0	11.22	14.95
1.5	15	1.74	0.473	0.57	5.96	-3.0	8.71	14.95
2.0	20	1.63	0.475	0.47	6.01	-9.2	6.68	14.95
2.5	25	1.61	0.476	0.41	6.00	-15.9	5.39	14.95
3.0	30	1.51	0.477	0.36	6.00	-21.0	5.65	14.95
3.5	35	1.46	0.477	0.28	6.00	-24.2	4.91	14.95

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ Total Metals*], [✓ Iron], [✓ Sulfate], [✓ Methane]

pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = HNO₃ =

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Sampler's initials: JK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 **Ft. Wainwright, Alaska**

Project #: 9003-05
Date: 10/18/16
Time: 1015
Sampler: JK
Weather: Overcast
QA/QC Sample ID/Time/LOCID: —

Site Location: [✓ Landfill] / CAT Shed
Probe/Well #: AP 5589
Sample ID: 16FWOU4 17 WG
Outside Temperature: 23°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 #:** 14 **Water Level:** SOC 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): 56.32
Depth to Water from TOC (feet): - 16.00
Column of Water in Probe/Well (feet): = 40.32
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): 6.6

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* ±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)
0.5	5	1.56	0.873	1.93	5.65	85.8	3.39	16.04
1.0	10	1.06	0.876	1.00	5.76	55.4	2.42	16.04
1.5	15	1.07	0.936	0.82	5.90	40.0	2.35	16.04
2.0	20	1.10	0.963	0.70	6.07	24.8	1.96	16.04
2.5	25	1.10	0.974	0.61	6.19	14.2	2.09	16.04
3.0	30	1.08 ✓	0.977 ✓	0.62 ✓	6.21 x	6.08 x	1.94 ✓	16.04

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:
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ Total Metals*], [✓ Iron], [✓ Sulfate], [✓ Methane],
pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = HNO₃ =

Purge Water

Gallons generated: 3.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: JK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-05
Date: 10/18/16
Time: 1130
Sampler: SK
Weather: P cloudy
QA/QC Sample ID/Time/LOCID: —

Site Location: Landfill / CAT Shed
Probe/Well #: AP-6535
Sample ID: 16FWOU4 18 WG
Outside Temperature: 20°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 #: 14 Water Level: SOLG

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 90.80
Depth to Water from TOC (feet): - 13.22
Column of Water in Probe/Well (feet): = 77.58
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): 12.6

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.

			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)
0.5	5	0.83	0.377	3.02	5.55	28.3	48.85	13.25
1.0	10	1.17	0.386	1.33	5.58	29.9	40.07	13.25
1.5	15	1.15	0.436	0.89	5.81	8.8	21.42	13.25
2.0	20	1.21	0.484	0.59	5.99	-23.5	12.61	13.25
2.5	25	1.25	0.493	0.53	6.05	-31.6	11.37	13.25
3.0	30	1.21	0.496	0.47	6.07	-34.1	10.16	13.25
3.6	35	1.26	0.497	0.45	6.08	-35.6	9.41	13.25

SK

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:
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC], [✓ Total Metals*], [✓ Iron], [✓ Sulfate], [✓ Methane]
pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = 4m HNO$_3$ = 0

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: SK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-03 **Site Location:** Landfill

Date: 10/18/16 **Probe/Well #:** AP-8063

Time: 1315 **Sample ID:** 16FWOU419WG

Sampler: SK

Weather: P. Cloudy **Outside Temperature:** 25°F

QA/QC Sample ID/Time/LOCID: 16FWOU420WG / 1345 / 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 #: 14 Water Level: 5069

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): - 15.43

Column of Water in Probe/Well (feet): = 105.21

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): 17.2

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					<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)
0.5	5	3.23	0.819	1.03	6.35	-25.0	8.62	15.44
1.0	10	3.60	0.864	0.73	6.37	-50.6	6.95	15.44
1.5	15	3.47	0.867	0.64	6.33	-52.2	5.13	15.44
2.0	20	3.27	0.869	0.59	6.34	-54.3	4.77	15.44
2.5	25	3.18	0.868	0.53	6.32	-54.8	4.13	15.44
3.0	30	3.09	0.869	0.48	6.29	-56.1	3.73	15.44
3.5	35	3.02	0.870	0.43	6.29	-56.8	3.42	15.44

SK

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC] PAH, EDB, GRO, DRO [✓ Iron] [✓ Sulfate] SVOC, Methane, Metals

pH checked of samples: [✓ Y] N Approximate volume added (mL): HCl = HNO₃ = Ø

Purge Water

Gallons generated: 5.0 Containerized and disposed as IDW? [✓ Yes] No If No, why not?

Sampler's Initials: SK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 **Ft. Wainwright, Alaska**

Project #: 9003-05
Site Location: CAT Shed
Date: 10-18-16
Probe/Well #: AD-10258MW
Time: 1515
Sample ID: 16FWOU4 21 WG
Sampler: SK
Weather: Clear
Outside Temperature: 31°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 #:** 14 **Water Level:** SOL 9

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

Column of Water in Probe/Well
Sampling Depth 10' screen

Total Depth in Probe/Well (feet bloc): 23.80
Well Screened [✓ Across] / **Below** water table
Depth to Water from TOC (feet): - 16.86
Depth tubing / pump intake set* approx. 17.8 feet below top of casing
Column of Water in Probe/Well (feet): = 6.94
*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): 1.13

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)
0.5	5	3.49	0.655	1.85	5.32	95.7	46.49	16.90
1.0	10	3.63	0.652	1.18	5.38	115.7	10.44	16.90
1.5	15	3.45	0.652	0.79	5.49	131.7	5.68	16.90
2.0	20	3.47	0.652	0.66	5.54	136.8	5.15	16.90
2.5	25	3.45	0.652	0.54	5.60	140.0	3.52	16.90
3.0	30	3.41	0.654	0.43	5.64	141.2	2.35	16.90
3.5	35	3.40	0.654	0.38	567	142.4	1.32	16.90
				SK				

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): ~~VOC, TAH, EDB, GRO, DRO, Iron, Sulfate~~ VOC/SVOC/Methane/Metals/Fe/SO_4
pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = HNO$_3$ =

Purge Water
Gallons generated: 4.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Sampler's Initials: SK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

Project #: 9003-04

Date: 10/18/16

Time: 1630

Sampler: SK

Weather: Clear

Site Location: ~~[illegible]~~ CAT Shed

Probe/Well #: AP-10257MW

Sample ID: 16FWOU422WG

Outside Temperature: 32°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 #: 14 Water Level: SOL 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): 24.5

Depth to Water from TOC (feet): - 17.31

Column of Water in Probe/Well (feet): = 7.19

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. 18.3 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					<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)
0.5	5	2.78	0.951	1.72	6.06	112.3	107.2	17.34
1.0	10	2.89	0.949	1.20	5.99	111.3	18.42	17.34
1.5	15	2.92	0.932	1.01	5.97	109.4	15.86	17.34
2.0	20	3.00	0.918	0.92	5.99	105.4	9.25	17.34
2.5	25	2.96	0.915	0.84	6.03	102.7	6.13	17.34
3.0	30	2.93	0.906 ✓	0.79 ✓	6.05 ✓	96.3 ✓	4.98	17.34

SK

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): ~~VOC, PAH, EDB, GRO, DRO, Iron, Sulfide~~ VOC/SVOC/Methane/Total Metals/SO4/Fe

pH checked of samples: [✓ Y] N Approximate volume added (mL): HCl = HNO₃ = ∅

Purge Water

Gallons generated: 3.5 Containerized and disposed as IDW? [✓ Yes] No If No, why not?

Sampler's Initials: SK Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU3 **Ft. Wainwright, Alaska**

Project #: 9003-03
Date: 10/18/16
Time: 1900
Sampler: SK
Weather: Clear

Site Location: BHTF / VPA / VPB / VPC / ROLF
Probe/Well #: Rinsate 23
Sample ID: 16FWOU423 WG
Outside Temperature: 35°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 #_____ 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 bloc):
Depth to Water from TOC (feet): -
Column of Water in Probe/Well (feet): =
N/A
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.

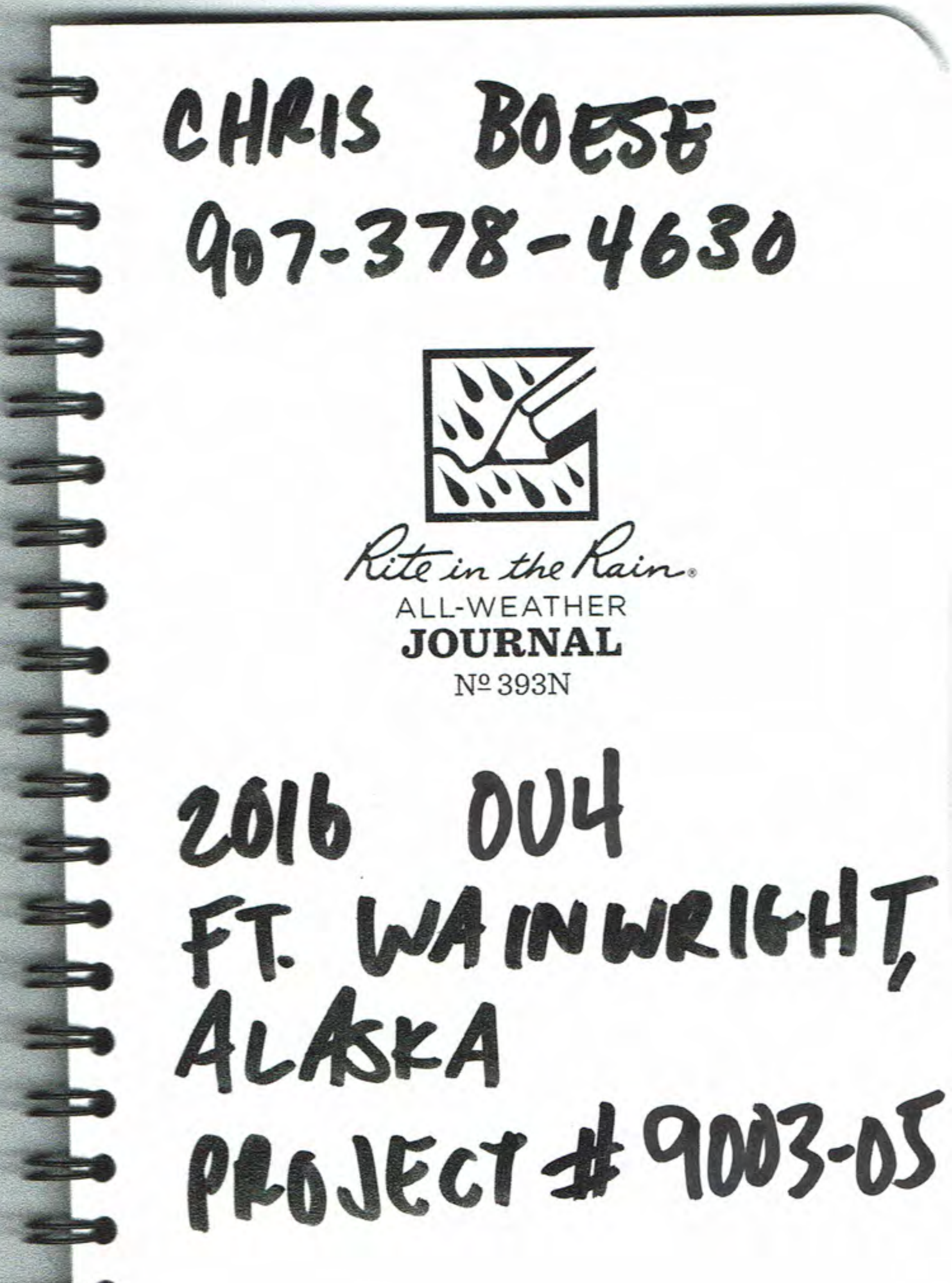
Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential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

Rinsate Collected on
pump used in AP-6535

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:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): ~~VOC, PAH, EDB, GRO, DRO, Iron, Sulfate~~ VOC/SVOC/Metals/Methane/Fe/SO4
pH checked of samples: [✓ Y] N Approximate volume added (mL): HCl = 1m HNO_3 = 0

Purge Water
Gallons generated: N/A Containerized and disposed as IDW? Yes / No If No, why not?
Sampler's Initials: Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other



CHRIS BOESE
907-378-4630

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2016 OU4
FT. WAINWRIGHT,
ALASKA
PROJECT #9003-05

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
→
→

Name ____________________
____

Address ____________________
____

Phone ____________________

Project ____________________
____
____
____

OU4 LANDFILL, FWW

7/12/16

1100 - PREP TO GWS AT LANDFILL.

1212 - ARRIVE AT FWW LANDFILL - PREP GEAR

1236 - ARRIVE AT AP-5589
GWS AP-5589 - AT 1350
16FWOU408WG

TRIED GETTING SUB PUMP DOWN AP-5888, BUT WELL HAS BREAK AT 5.69' →
ALSO TRIED PUTTING BLADDER PUMP DOWN WELL → NO LUCK. SEND JK BACK TO GET PERI PUMP. SET UP TO SAMPLE AP-6532 + QC (SWITCHED FROM (QC) AP-5588.)

~~1620~~ CB 1600
- GWS AP-6532 -
16FWOU409WG + DUPLICATE
1498

APFWOU410WG AT 1620
LOCID = AP-6060. CLEAN UP - REMOVE HEAT TRACE IN AP-6532 HZP MB SET UP ON AP-8063.

1755 - LEAVE SITE.

1809 - SHOP CLEAN UP

1835 - COLLECT RINSATE OFF PUMP USED IN AP 6532 - 16FWOU413WG AT

1900 - END OF DAY

Chr Baese

7/13/16
1400 - 1200 - PACK / SHIP
OU4 LANDFILL SHIPMENT

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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

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Contract

W911KB-16-D-0005

Project

9003-05

Josh Klyastra

7/7/16 Sunny 72°F

1530- Park UTV in trailer then leave site to prep GW gear for next week.

End Day @ 1730

JK

2/2

7/8/16 P. Cloudy 53°F

0630- Drive to site.

0645- arrive @ BHPR to refuel the generators.

0741- found 3K generator @ AP-8063 out of fuel upon arrival.
→ propane gen. @ [illegible] AP-6535 was still running. exchanged one propane tank
↳ Now walking to AP-6532 to refuel generator.

0750- generator @ AP-6532 found empty
↳ refuel with gasoline that was stashed here last night

0803- Unable to reach AP-6530 from AP-6532 even on foot
↳ swampy area is too soft and deep to pass through.

1/4

7/9/16 Clear 79°F

1600 - Return to BHPR
↳ stop and fill fuel jugs and prepare bottles on the way to the site.

1642 - unload UTV and prepare to refuel the generators.

1709 - AP-6530 → found generator still running. refuel and move to next well.

1734 - Generator @ AP6535 still running (propane)

1740 - gen @ 8063 had empty tank

1746 - gen @ AP-6532 has about 1/3 tank left and is not running.

2/

7/9/16 Cloudy 79°F

1810 - UTV parked for the night. Leaving BHPR site.

↳ there is a rain storm coming that might increase the water levels of the area. Access to the wells may become an issue when it comes time to sample.

End Day @ 1830

JK

3/3

7/11/16 Overcast 57°F

0630- Drive to BHPR to refuel generators

0707- AP-653 still running.

0728- AP-6535 still running
↳ switch out bottle

0733- AP-8063 - not running
↳ tank empty.

0740- AP-6532 - generator off with fuel tank mostly full.
↳ heat trace is loose in well but the tubing from last year is not.

0800 - leaving project for a separate task

1/4

7/11/16 Overcast 60°F

1030- Site visit to check the gen. @ AP-6532
↳ dropped ice off with MB.

1037 - walked back to find that rental gen. is not running and most of the fuel is still remaining in the tank.
↳ restart and watch for a few minutes.

1050- generator still running.

1100- leaving site to do a separate task

GK

3/4

7/11/16 overcast

1430 - Drive to OW4/BHPR to get the UTV and Mob. MB to well AP-8061 for him to start sampling.

1510 - Drive to AP-6532.
↳ found gen. off and most of the fuel still remaining.

The Heat Trace and last years tubing are loose in the well but I'm not sure how much the well is thawed with this gen. not running properly.
↳ if it is still in this condition tomorrow morning I will move the 3K to this well and run it for the day.
AP-6532 will have to be sampled Wednesday

3/4

7/11/16 Cloudy

1538 - AP-6535 is still running
→ refueled AP 8063

1635 - Demob MB and return to the shop to prep gear for sampling tomorrow.

1658 - leaving site.

1715 - Decon Pumps for MP
↳ prep GW Gear

End Day @ 1815

JK

4/4

7/12/16 Clear 55°F

0630- prepare for OU4 GW sampling

0830- leaving shop to drop yesterdays Purge water @ DEZA
↳ get fuel for UTV
↳

0940- arrive @ BHPR
↳ load gear in to UTV/Trailer and meet Mike @ Landfill

1000- arrive @ 6530 to set up @ well and remove generator

1030- collect generator from AP-6535 and take both up to the trailer.

1050 - move gear to AP-5588/5589 and set up to sample.
~~↳ move~~
* Moving MB to next well AP-6535

7/12/16 Clear 70°F

Times unknown for the following tasks.

- CB arrived on site and set up @ AP-5589 to sample.
- get tubing for MB @ AP-6535.
- set up gear @ AP-8063
- remove last generator and return to rental store.
- pick up Peri-pumps from the shop for AP-5588 and AP-8063.
- Move CB to AP ~~8~~6532
- Set up and sample -5588
- Return gear to van
- move CB gear to van

7/12/16 Clear 80°F

1800 - Return to AP-8063 and Demob MB from the site.
↳ Return to BHPR to load trailer and Demob to shop.

1910 - leaving site
OU4 spring sampling finished
↳ Return to Shop

End Day @ 1945.

3/

10/13/16 Clear 27°F

0630 - prepare gear for thawing wells @ OU4 landfill
→ collect gear ; fuel jugs generators, cables & locks extension chords, etc.
→ hook up UTV trailer.
→ Rent 2 generators

0815 - leaving shop for site.

0845 - UTV is stuck in hole in ice. Winch is having trouble and battery keek dying. have had to jump it 3 times.

0950 - Had to jack up the UTV and put logs under the tires to get it out.
↳ moving to put Generators @ wells: AP-6530/-6532/6535 and AP-8063.

1/3

10/13/16 Clear 35°F

1030- generator set @ AP-6535 and AP-6532. moving to AP-6535.

1050- pull cord on propane generator is broken will have to get it fixed and put out the gasoline 2K for now (which is not out here w/ me but at the shop).

1130- All generators in place, except the propane gen. @ AP-6535, and are running.

1145 - end project @ this time

1700- Return to Landfill to refuel generators

1810- UTU broke through the ice and the right side is stuck

2/3

10/13/16 Clear 45°F

1810 - Unable to winch forward out of hole. UTU is up to the gas tank lid on the righ side in water. Attempting to pull it sideways.

1847- UTU out of hole → moving to set the gas generator @ AP-6535 and then to leave.

End project Day @ 1915.

JK

3/3

10/14/16 Clear 23°F

0630 - Refuel generators

0900 - end project for this morning

1500 - Refuel generators

* No issues w/ the generators so far. all generators have been running full cycles and the tanks are empty upon arrival

End Day @ 1700

3K

1/1

10/15/16 Clear 20°F

0600 - Drive to BHPR to unload the UTV.

→ generator @ AP-6530 is still running but nearly empty (Rental)
→ gen @ AP-6532 is empty (Rental)
→ Generator @ AP-8063 is empty (FES 3K)
→ Gas 2K @ AP-6535 is empty
↳ install Propane 2K

0740 - Propane generator is giving oil overfilled alarm and will not run.
↳ refuel the gasoline gen and leaving

end project @ 0830

1800 - Drive to BHPR to refuel generators

1/2

10/15/16 Clear 45°F

1820 - Generator @ AP-6530
was empty and I refueld it
→ AP-6532 is also empty.

1900 - having difficulty getting
the FES 3K started
and the fuel tank is
not empty from this
morning.

1930 - the gasoling generator
@ AP-6535 will not start
and neither will the
propane generator. I
believe the propane in the
tanks is too cold.
↳ put new propane bottle on
and it started.

end Day @ 2015

2/2

10/16/16 Clear 20°F

0600 - Drive to BHPR to
refuel generators @ OU4

* Propane generator is
not running. able to
restart it.

0700 - generator @ -6530 is
at a ½ tank and not
running. top it off and
restart

0716 - Gen. @ AP-6532 is empty
↳ fuel and restart

0721 - Gen @ AP-8063 is half
full and will not restart.
↳ tried to also restart the
2K gasoline but it will also
not start.

End Project @ 0800

1/2

10/16/16 Clear 25°F

1800 - Drive to BHPR.

1830 - Propane Generator is off again. Put covers from extraction wells over Propane Bottles to keep warm.

1842 - Pull cord brok on rental generator @ -6530 when restarting will have to get tools from my car to fix.

1900 - AP-6532 generator is empty to refuel and restart

1907 - 3K and 2K for -8063 will still not start.
→ brough the 2K inside to warm up all day and it still would not start.

2/3

10/16/16 Clear 20°F

1930 - Back at AP-6530 to fix pull cord on rental.

2015 - generator running and leaving well.

End project Day @ 2045

SK

3/3

10/17/16 Clear 20°F

0600 - Drive to BHPR to refuel generators

→ Propane still running

→ AP-6530 3/4 full and not running.
↳ top off and restart

→ AP-6532 empty

→ AP-8063 not running and will not start

* planning on sampling -6530 & -6532 today and then moving a gen. to 8063 to thaw that well and sample it on Wednesday.

end project @ 0800.

Y

10/17/16 Clear 28°F

0900 - Prep gear for GW sampling
↳ calibrate YSI & Turbidimeter

1100 - fill fuel jugs and propane bottle

1200 - Drive to site and refuel generator from -6532 to AP-8063

1300 - set up to sample @ AP-6532.

1410 - Decon Pump and move to AP-6530

1440 - set up to sample and begin purging water.

1600 leaving well. Drive to BHPR

10/17/16 Clear

1630 - Return to the office
↳ store samples in the fridge
→ unload used gear.

End Day @ 1700

Slc

3/3

10/18/16 Cloudy 20°F

0630 - Prep gear for GW sampling @ OU4 Landfill

0745 - Drive to BHPR
↳ to transfer into UTV

0830 - Check on AP-6535 and AP-8063. both generators are off. the Heat Trace and tubing is loose in both wells.

0900 - set up to sample @ AP-5589

1010 - completed sampling 5589.
→ check in @ Landfill.

1015 - No one @ Landfill but gate is open. Called the # on the sign but go no answer.
↳ move to sample AP-6535.

10/18/16 P. Cloudy 25°F

1127 - Completed sampling AP-6535
↳ move to sample AP-8063
↳ collect QC samples also

1330 - completed collecting sample @ AP-8063

↳ Return to BHPR to load gear into the van and to return to collect the generators

1350 - able to contact landfill personal and gain access to the CAT Shed wells
↳ proceed to sample those wells

1400 - set up to sample @ AP-10258MW

1518 - move to sample @ AP-10257MW

2/

10/18/16 Clear 34°F

1650 - Return to BHPR to get the UTV and to collect the generators.

1800 - Leaving BHPR to return to the office

1900 - Collect Rinsate 23 from the pump used in AP-6535

End Day @ 1930

JK

3/3

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7-10-16 —

CONTRACT #:
W911KB-16-D-0005

CONTENTS

PAGE	REFERENCE	DATE

7/10/16

prep for gw sampling - OU4
pack up gear including
pumps, decon buckets, tubing,
Sample Kit, water levels, etc.
get organized - which wells
and sample # with help
from Josh.

7/11/16
0745 Calibrate YSI #9 and
turbidity meter #12. Talk to
V - MO MS/MSD on AP-10257MW.
0845 mobe to landfill
0900 Check in w/ Landfill
Ron Sindell Set up on
AP-10257MW - UFP QAPP WS
#18H has incorrect screen
interval (after checking
Boring log w/ CB)
well AP-10258 has key lock
(not combo) and FNLF-4
has animal nest in metal
casing.

7/11/16

9-1130 Sample AP-10257MW
and collect field Dup.
"AP-5050"

1130 move to AP-10258 MW
1230 collect sample from
well AP-10258 MW

1250 move to FWLF-4
grass nest in welded
box (see photo)

1400 Sample FWLF-4
1430 Load up - leave fenced
area
1440 locate well AP-8061 in
woods - bugs are bad.
1500 Josh arrives @ trail head
w/ UTV and takes my
gear to well.
1520 Set up on AP-8061
"1700" Sample AP-8061
(actually 1620)
text Josh - he arrives
and ferries gear out

7/11/16
1700 wash water level
and load up van
leave site for office
1715 place samples in Sample
fridge. Fill out IDW
log. Label drums.
1745 leave for day

7/12/16
0745 - shop - get organized
talk to Josh about plan
calibrate extra YSI
900 leave for FTW
920 arrive @ Landfill
930 Josh picks me up w/ UTV
load and Mike to
AP-6530
1000 arrive @ AP-6530 - in
swamp. Set up to sample
1145 Sample AP-6530
Decon Mega Monsoon Sub.
pump.
1220 Josh loads me up and
takes me to AP-6535

7/12/16

1245 arrive @ AP-6995
need more tubing
+ Josh bring me some
1430 Sample AP-6995
move to AP-6598 - help
CB w/ labels for MS/MSD
1530 Set up on AP-8863
had to wait for CB
YSI + turbidimeter
used peri pump - submer.
would not fit
1800 collect sample AP-8663
(actually 1820)
1900 pack up and leave landfill
w/ Josh's help + UTV.
1915 Return to shop unload
put samples in fridge
rinse out YSI and put
in pH 4 solution. Chg
deep cell battery + peri
pump
2000 leave shop for night

7/13/16 9003-06

0750 arrive @ Shops - calibrate
YSI, prep for GW sampling @
MS Sparge Curtain w/ Josh
0900 leave shop for FTW.
0920 on site. Set up on
AP-10222MW
1045 Sample AP-10222 MW
1100 Set up on AP-10221MW
1200 Sample AP-10221MW
1230 Set up on AP-6946
1345 Sample AP-6946
1400 Set up AP-7662
1510 Sample AP-7662
pack up - Label IDW drums
1600 leave site
1620 Return to Shops
FTK wash pumps after putting
samples in fridge
1745 leave for day

APPENDIX B

CHEMICAL DATA QUALITY REVIEW AND ADEC CHECKLISTS

FINAL

CHEMICAL DATA QUALITY REVIEW

Operable Unit 4

Fort Wainwright, Alaska

NPDL # 16-086

Prepared: January 31, 2017

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 Final Postwide Uniform Federal Policy for Quality Assurance Project Plan (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
ALS	ALS Environmental
B	analytical result is qualified as a potential high estimate due to contamination present in a blank sample
°C	degrees Celsius
CDQR	Chemical Data Quality Review
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
FES	Fairbanks Environmental Services, Inc
J	analytical result is qualified as an estimated value because the concentration is less than the LOQ, or because of a QC deviation with unknown bias
J+	analytical result is qualified as an estimated value with a high-bias due to a QC deviation
J-	analytical result is qualified as 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
ND	non-detect result
NPDL	North Pacific Division Laboratory
OU4	Operable Unit 4
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories
R	analytical result is rejected and is not suitable for project use
RPD	relative percent difference
SDG	sample data group
SVOC	semi-volatile organic compounds
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
VOC	volatile organic compounds

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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 2016. The groundwater events are summarized in Section 1.3. Groundwater sample summary 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 Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2016), 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. QC deviations that do not impact data quality (e.g., high LCS recovery associated with non-detect results), are not discussed. 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 75.345, Table C (ADEC, 2016a).

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, 2016). 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	Preparation Method	Analytical Method	Limit of Detection	Accuracy (%)	Precision (RPD, %)	Completeness (%)
Benzene	SW5030B	SW8260C	0.50 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	58-137	20	90
Trichloroethene			0.50 µg/L	79-123	20	90
Remaining Volatile Organic Compounds (VOCs)			Analyte Specific[1]	Analyte Specific[1]	20	90
bis(2-Ethylhexyl) phthalate	SW3520C	SW8270D-LL	9.5 µg/L	55-135	20	90
Semivolatile Organic Compounds (SVOCs)			Analyte Specific[1]	Analyte Specific[1]	20	90
Methane	RSK175		1.3 µg/L	73-125	12	90
Total Metals	SW6020A		Analyte Specific[1]	Analyte Specific[1]	20	90
Iron (field filtered)	SW6010C		20 µg/L	87-115	20	90
Sulfate	300.0		100 µg/L	90-110	20	90

[1] The analyte-specific limits of detection (LODs) and accuracies are presented in the UFP-QAPP (FES, 2016)
µg/L – micrograms 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 below 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.
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.

DL – Detection limit; LOQ – limit of quantitation

1.3 Summary of Groundwater Samples

A total of 20 groundwater samples, consisting of 17 project samples and three field duplicate samples, were collected from monitoring wells at the OU4 sites during 2016. In addition, one MS/MSD sample was submitted for every analysis (minimum of one per 20 samples), a trip blank sample accompanied each cooler containing samples for volatile analyses, and equipment blank samples were collected to assess the potential for cross-contamination of the submersible pump. Samples were analyzed by the methods presented in Table B-1.

All project and quality control samples were analyzed by ALS Environmental (ALS) of Kelso, Washington except for methane samples; methane samples were subcontracted to ALS of Simi Valley, California for analysis. The project laboratory is validated by the State of Alaska through the Contaminated Sites Program and is Environmental Laboratory Accreditation Program (ELAP) certified. In addition, ALS is compliant with the DoD QSM for Environmental Laboratories, Version 5.0 (DoD, 2013), for the methods employed for this project. Note that United States Environmental Protection Agency (EPA) Methods 300.0 (sulfate) and RSK175 (methane) are not listed as CS analyses and, therefore, these methods are not certified by ADEC.

Samples were shipped in two sample data groups (SDGs) and assigned the ALS report numbers K1607907 and K1612733. A sample summary table (Table C-1) and 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 ALS and are included in two SDGs (K1607907 and K1612733). See the associated ADEC Laboratory Data Review Checklists for more elaborate data quality descriptions.

2.1 Sample Collection

All monitoring wells were purged and sampled with submersible pumps employing dedicated Teflon-lined pump tubing, with the exception of those bulleted below. Groundwater sampling activities were recorded on groundwater sample forms provided in Appendix A. In addition, one equipment blank was collected from a decontaminated submersible pump during each sampling event to assess potential sampling cross-contamination.

Groundwater sample collection forms were reviewed to ensure that well drawdown and groundwater parameters met the stabilization criteria identified in the ADEC Field Sampling Guidance (ADEC, 2016b) and the UFP-QAPP (FES, 2016), 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 (when applicable). 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 product 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.
- All samples were collected with a submersible pump except for the sample from well AP-5588 (16FWOU411WG) and two samples from well AP-8063 (16FWOU412WG and 16FWOU419WG). These samples were collected with a peristaltic pump because the submersible pump would not fit into the wells due to damaged casings.

Equipment blank contamination is discussed in Section 2.3; equipment blank contamination potentially impacts all project samples except samples from wells AP-5588 (16FWOU411WG) and AP-8063 (16FWOU412WG, 16FWOU419WG, and 16FWOU420WG) because these samples were collected with a peristaltic pump using new or dedicated tubing.

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.

2.2 Sample Handling

The evaluation of proper sample handling procedures include verification of the following: correct COC documentation, appropriate sample containers and preservatives, cooler temperatures maintained within the ADEC-recommended temperature range (0 to 6 degrees Celsius [°C]), and sample analyses performed within method-specified holding times. The following discrepancy was noted upon receipt at the laboratory.

Documentation Discrepancy

- The second COC page from cooler 071301 was not signed upon receipt at the laboratory. The first page was signed and dated appropriately (report K1607907). Samples were analyzed according to the methods described on the COC forms and data quality was not impacted by this laboratory documentation oversight.

2.3 Blanks

Method blanks, trip blanks, and equipment blanks were utilized to detect potential cross-contamination of project samples. Method blanks detect laboratory cross-contamination, trip blanks assess shipment and storage cross-contamination, and equipment blanks evaluate the potential for cross-contamination associated with wells that were sampled with non-dedicated submersible pumps. The following blank contaminations were noted.

Method Blanks

Method blank samples were analyzed in every batch. The following analytes were detected in method blank samples at concentrations less than the limit of quantitation (LOQ) and was also detected in associated project samples within five times (or ten times for common laboratory contaminants) the concentration detected in the method blank. 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 either less than the ADEC cleanup level they were used to monitor natural attenuation processes (where results are evaluated by order of magnitude concentration changes). See the associated ADEC Checklists for more detailed discussion.

K1607907

- Iron: equipment blank sample 16OU413WQ
- Chromium: equipment blank sample 16FWOU413WQ
- Silver: 16FWOU401WG, 16FWOU402WG, and 16FWOU407WG
- Naphthalene: 16FWOU401WG and 16FWOU402WG
- n-Butylbenzene: 16FWOU403WG

K1612733

- Chloroform: 16FWOU415WG and trip blank sample 16FWOU424WQ.

- Methylene Chloride: 16FWOU415WG, 16FWOU417WG, 16FWOU418WG, 16FWOU419WG, 16FWOU420WG, and trip blank sample 16FWOU424WQ

Trip Blanks

Trip blank samples were shipped in every cooler containing samples for volatile analyses. The following analyte was detected in the specified trip blank sample at a concentration less than the LOQ and was also detected in associated project samples within five times (or ten times for common laboratory contaminants) the concentration detected in the trip blank. Consequently, these analytical results were qualified (B) as potential storage/travel cross-contamination. In all cases, impact to data quality was minor as the affected results were less than the ADEC cleanup level. See the associated ADEC Checklist for more detailed discussion.

K1607907 (trip blank 16FWOU413WQ)

- Chloromethane: 16FWOU402WG, 16FWOU403WG, 16FWOU404WG, 16FWOU405WG, 16FWOU408WG, 16FWOU409WG, 16FWOU410WG, and 16FWOU412WG

Equipment Blanks

Two equipment blank samples were collected to evaluate the potential for submersible pump cross-contamination; one was collected during the July sampling event (16FWOU413WQ) and one was collected during the October sampling event (16FWOU423WQ). The results of these equipment blank samples were compared against results of project samples collected at the landfill. Analytes that were detected in equipment blank samples that resulted in data qualification are discussed below. Equipment blanks are further discussed in associated ADEC Checklists. Sample results of the wells not sampled with a submersible pump (Section 2.1; third bullet) were excluded from evaluation.

The following analytes were detected in equipment blank samples at a concentration less than the LOQ and were also detected in associated project samples within five times (or ten times for common laboratory contaminants) the concentration detected in the equipment blank. Consequently, these analytical results were qualified (B) as potential sampling cross-contamination. In all cases, impact to data quality was minor as the affected results were either less than the ADEC cleanup level or were used to monitor natural attenuation processes (where results are evaluated by order of magnitude concentration changes).

K1612733 (equipment blank 16FWOU413WQ)

- Toluene: 16FWOU401WG, 16FWOU402WG, 16FWOU409WG, and 16FWOU410WG
- Acetone: 16FWOU410WG
- Ethylbenzene: 16FWOU402WG and 16FWOU404WG
- o-Xylene: 16FWOU401WG and 16FWOU402WG

K1612733 (equipment blank 16FWOU423WQ)

- Sulfate: 16FWOU415WG, 16FWOU416WG, and 16FWOU418WG

- Antimony: 16FWOU415WG, 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG
- Barium: 16FWOU421WG
- Chromium: 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG
- Cobalt: 16FWOU416WG and 16FWOU417WG
- Copper: 16FWOU416WG
- Lead: 16FWOU416WG and 16FWOU417WG
- Nickel: 16FWOU416WG, 16FWOU417WG, and 16FWOU418WG
- Zinc: 16FWOU416WG and 16FWOU417WG
- Cadmium: 16FWOU415WG and 16FWOU417WG
- Toluene: 16FWOU415WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG
- 1,2,4-Trimethylbenzene: 16FWOU421WG
- Chloromethane: 16FWOU415WG, 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG
- m,p-Xylene and o-Xylene: 16FWOU421WG

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, an LCSD is required for all Alaska fuel methods to evaluate batch precision. For QC batches that do not contain an 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. No LCS and/or LCSD accuracy or precision discrepancies requiring qualifications were noted.

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. In addition, precision of each QC batch was evaluated by performing either an MSD sample analysis or a sample duplicate analysis and calculating the RPD. All QC batches associated with OU4 sites have met these criteria, except for the batch listed below.

- Sulfate QC batch: 266582 (report K1607907).

Although potential sample matrix interference cannot be examined in the above listed QC batch, acceptable LCS recoveries indicate that the analytical batch was operating within the control criteria. Precision in this batch also was evaluated from the analysis of an MSD, LCSD, or duplicate sample.

The accuracy of the analyte recoveries, and the precision of the MS/MSD or laboratory duplicate pairs, was evaluated. The MS/MSD recovery and/or RPD exceedances requiring qualifications are summarized below.

- The nickel MS sample prepared from 16FWOU409WG contained in extraction batch 267288 recovered below the control limits (84% vs. 85-117%) (report K1607907). The nickel results in parent sample 16FWOU409WG and associated field duplicate sample 16FWOU410WG were qualified (J-) as estimates with a low bias due to the low recovery. Impact to the results is negligible as the failure was marginal (1% low) and the detections were greater than one order of magnitude below the ADEC cleanup level.
- The volatile organic compound (VOC) MS and/or MSD samples prepared from 16FWOU409WG contained in extraction batch KWG1605891 recovered below the control limits for bromodichloromethane (78% vs. 79-125%), trans-1,3-dichloropropene (both 72% vs. 73-127%), dibromochloromethane (66% and 68% vs. 74-126%), and bromoform (63% vs. 66-130%) (report K1607907). The bromodichloromethane, trans-1,3-dichloropropene, dibromochloromethane, and bromoform results in parent sample 16FWOU409WG and associated field duplicate sample 16FWOU410WG were qualified (J-) as estimates with a low bias due to the low recoveries. Impact to the results is negligible as the non-detect LODs were at least one order of magnitude below the ADEC cleanup levels.
- The SVOC MS/MSD samples prepared from 16FWOU409WG contained in extraction batch KWG1605895 recovered below the control limits for 3,3’-dichlorobenzidine (19% and 24% vs. 27-129%) (report K1607907). The 3,3-dichlorobenzidine results in parent sample 16FWOU409WG and associated field duplicate sample 16FWOU410WG were qualified (J-) as estimates with a low bias due to the low recoveries. Although the 3,3-dichlorobenzidine results may be biased low and the non-detect LODs are greater than the ADEC cleanup level, impact to the project is negligible as the analyte is not a contaminant of concern at this petroleum release site.

2.6 Surrogate Recovery

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 recovery discrepancy that resulted in data qualification was noted.

- VOC surrogate 4-bromofluorobenzene recovered below the control limits (85-114%) in sample 16FWOU402WG (84%) (report K1609707). The VOC analytes associated with this surrogate (1,1,2,2-tetrachloroethane, bromobenzene, n-propylbenzene, 1,2,3-trichloropropane, 2-chlorotoluene, 1,3,5-trimethylbenzene, 2-chlorotoluene, 1,3,5-trimethylbenzene, 4-

chlorotoluene, tert-butylbenzene, 4-isopropyltoluene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, n-butylbenzene, 1,2-dichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2,4-trichlorobenzene, hexachlorobutadiene, naphthalene, and 1,2,3-trichlorobenzene) were qualified (J-) as estimates with a low bias due to the low surrogate recovery. Impact to the results is negligible as the recovery failure was marginal (1% low) and most detections or non-detect LODs were a minimum of one order of magnitude below the ADEC cleanup level or no cleanup level was established. The exception is 1,2,3-trichloropropane, which had a non-detect LOD above the cleanup level; however, this analyte is not a site contaminant of concern.

2.7 Field Duplicates

Three field duplicate samples were collected and submitted to the laboratory as blind samples during groundwater sampling operations at the OU4 sites. Field duplicate samples were collected at a minimum frequency of 10 percent for each analytical method, and for each SDG, which meets the requirements of the UFP-QAPP.

All detected result for the primary and field duplicate samples are summarized in Table B-3 on the following pages. Non-detect field duplicate results are also presented for OU4 contaminants of concern.

In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. If both results of the field duplicate pair were less than the LOQ (i.e., J-flagged or non-detect), 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 bis(2-ethylhexyl)phthalate in field duplicate pair 16FWOU409WG/16FWOU410WG and 1,1,2,2-tetrachloroethane in field duplicate pair 16FWOU419WG/16FWOU420WG. Impact to the results is negligible as the detections were consistent with historical concentrations observed for the affected wells.

Field duplicate results for other analytes (non-contaminants of concern) for OU4 sites are compared and qualified, as appropriate, in the associated ADEC Laboratory Data Review Checklists at the end of Appendix B.

Table B-3 – Groundwater Field Duplicate Sample Results Evaluation

Analyte	Method	Primary 16FWOU401WG AP-10257MW[2]	Field Duplicate 16FWOU402WG AP-5050[2]	RPD, %	Comparable Criteria Met?[1]
Antimony	SW6020A	0.433 [0.012]	0.456 [0.012]	5	YES
Arsenic	SW6020A	1.6 [0.3]	1.5 [0.3]	6	YES
Barium	SW6020A	387 [0.025]	388 [0.025]	0	YES
Beryllium	SW6020A	0.023 [0.02]	0.019 [0.02] J	19	YES
Cadmium	SW6020A	0.432 [0.02]	0.408 [0.02]	6	YES
Chromium	SW6020A	1.39 [0.05]	1.38 [0.05]	1	YES
Cobalt	SW6020A	20.1 [0.02]	20 [0.02]	0	YES
Copper	SW6020A	3.74 [0.05]	3.81 [0.05]	2	YES
Lead	SW6020A	0.091 [0.01]	0.095 [0.01]	4	YES
Nickel	SW6020A	71.3 [0.05]	70 [0.05]	2	YES
Selenium	SW6020A	0.9 [1] J	0.7 [1] J	25	Not applicable
Silver	SW6020A	0.011 [0.01] J	0.009 [0.01] J	20	Not applicable
Vanadium	SW6020A	2.73 [0.05]	2.72 [0.05]	0	YES
Zinc	SW6020A	50.7 [0.5]	51 [0.5]	1	YES
Methane	RSK175	1400 [0.63]	1500 [0.63]	7	YES
Sulfate	E300.0	3.4 [0.2]	3.4 [0.2]	0	YES
Iron	SW6010C	8130 [10]	8040 [10]	1	YES
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.2]	ND [0.2]	0	Not applicable
1,1,2-Trichloroethane	SW8260C	ND [0.4]	ND [0.4]	0	Not applicable
1,2,4-Trimethylbenzene	SW8260C	2.2 [0.2]	2 [0.2]	10	YES
1,2-Dichloroethane	SW8260C	0.3 [0.15] J	0.27 [0.15] J	11	Not applicable
1,3,5-Trimethylbenzene	SW8260C	0.33 [0.2] J	0.32 [0.2] J	3	Not applicable
4-Isopropyltoluene	SW8260C	0.31 [0.2] J	0.25 [0.2] J	21	Not applicable
Benzene	SW8260C	29 [0.1]	28 [0.1]	4	YES
Chloromethane	SW8260C	ND [0.2]	0.11 [0.2] J	58	Not applicable
cis-1,2-Dichloroethene	SW8260C	6.6 [0.2]	6.6 [0.2]	0	YES
Ethylbenzene	SW8260C	ND [0.1]	0.05 [0.1] J	67	Not applicable
Isopropylbenzene	SW8260C	2.1 [0.2]	1.9 [0.2] J	10	YES
Naphthalene	SW8260C	0.16 [0.3] J	0.17 [0.3] J	6	Not applicable
n-Butylbenzene	SW8260C	0.44 [0.1] J	0.43 [0.1] J	2	Not applicable
n-Propylbenzene	SW8260C	0.77 [0.2] J	0.74 [0.2] J	4	Not applicable
o-Xylene	SW8260C	0.45 [0.2] J	0.43 [0.2] J	5	Not applicable
sec-Butylbenzene	SW8260C	1.2 [0.1] J	1.1 [0.1] J	9	Not applicable
tert-Butylbenzene	SW8260C	0.12 [0.2] J	0.11 [0.2] J	9	Not applicable
Toluene	SW8260C	0.23 [0.1] J	0.25 [0.1] J	8	Not applicable
trans-1,2-Dichloroethene	SW8260C	1.1 [0.2]	1.1 [0.2]	0	YES
Trichloroethene (TCE)	SW8260C	0.15 [0.1] J	0.14 [0.1] J	7	Not applicable
Vinyl chloride	SW8260C	0.12 [0.1] J	0.12 [0.1] J	0	Not applicable
Xylene, Isomers m & p	SW8260C	2.1 [0.2]	2 [0.2]	5	YES
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	ND [1.9]	ND [1.9]	0	Not applicable

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

Analyte	Method	Primary 16FWOU409WG AP-6532^2	Field Duplicate 16FWOU410WG AP-6060^2	RPD, %	Comparable Criteria Met?^{1}
Antimony	SW6020A	1.45 [0.012]	1.31 [0.012]	10	YES
Arsenic	SW6020A	1.1 [0.3]	1.1 [0.3]	0	YES
Barium	SW6020A	251 [0.025]	253 [0.025]	1	YES
Beryllium	SW6020A	0.037 [0.02]	0.03 [0.02]	21	YES
Cadmium	SW6020A	0.017 [0.02] J	0.011 [0.02] J	43	Not applicable
Chromium	SW6020A	2.67 [0.05]	2.54 [0.05]	5	YES
Cobalt	SW6020A	0.247 [0.02]	0.211 [0.02]	16	YES
Copper	SW6020A	5.14 [0.05]	4.6 [0.05]	11	YES
Lead	SW6020A	2.09 [0.01]	1.94 [0.01]	7	YES
Nickel	SW6020A	2.51 [0.05]	1.98 [0.05]	24	YES
Vanadium	SW6020A	3.19 [0.05]	3.29 [0.05]	3	YES
Zinc	SW6020A	24.6 [0.5]	21 [0.5]	16	YES
Methane	RSK175	1200 [0.63]	1300 [0.63]	8	YES
Sulfate	E300.0	4.9 [0.2]	5 [0.2]	2	YES
Iron	SW6010C	28900 [10]	30300 [10]	5	YES
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.2]	ND [0.2]	0	Not applicable
1,1,2-Trichloroethane	SW8260C	ND [0.4]	ND [0.4]	0	Not applicable
1,1-Dichloroethane	SW8260C	0.13 [0.2] J	0.12 [0.2] J	8	Not applicable
1,2-Dichloroethane	SW8260C	0.28 [0.15] J	0.29 [0.15] J	4	Not applicable
Acetone	SW8260C	ND [10]	4.1 [10] J	84	Not applicable
Benzene	SW8260C	13 [0.1]	13 [0.1]	0	YES
Carbon disulfide	SW8260C	ND [0.2]	0.07 [0.2] J	96	Not applicable
Chloroform	SW8260C	0.11 [0.2] J	0.09 [0.2] J	20	Not applicable
Chloromethane	SW8260C	0.1 [0.2] J	0.18 [0.2] J	57	Not applicable
cis-1,2-Dichloroethene	SW8260C	3 [0.2]	3.1 [0.2]	3	YES
Dichlorodifluoromethane	SW8260C	0.68 [0.2]	0.65 [0.2]	5	YES
Toluene	SW8260C	0.21 [0.1] J	0.19 [0.1] J	10	Not applicable
trans-1,2-Dichloroethene	SW8260C	0.4 [0.2] J	0.42 [0.2] J	5	Not applicable
Trichloroethene (TCE)	SW8260C	ND [0.1]	ND [0.1]	0	Not applicable
Vinyl chloride	SW8260C	0.2 [0.1] J	0.22 [0.1] J	10	Not applicable
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	10 [1.9]	23 [1.9]	79	NO
Dimethyl phthalate	SW8270D-LL	2.5 [2] J	1.8 [2] J	33	Not applicable
Phenol	SW8270D-LL	0.76 [0.5] J	ND [0.5]	41	Not applicable

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

Analyte	Method	Primary 16FWOU419WG AP-8063[3]	Field Duplicate 16FWOU420WG AP-6060[3]	RPD, %	Comparable Criteria Met?[1]
Antimony	SW6020A	0.118 [0.025]	0.106 [0.025]	11	YES
Arsenic	SW6020A	2.57 [0.13]	2.77 [0.13]	7	YES
Barium	SW6020A	713 [0.025]	748 [0.025]	5	YES
Beryllium	SW6020A	0.021 [0.02]	0.025 [0.02]	17	YES
Cadmium	SW6020A	0.02 [0.01] J	ND [0.01]	67	Not applicable
Chromium	SW6020A	1.16 [0.05]	1.09 [0.05]	6	YES
Cobalt	SW6020A	0.135 [0.02]	0.131 [0.02]	3	YES
Copper	SW6020A	0.25 [0.1]	0.25 [0.1]	0	YES
Lead	SW6020A	0.12 [0.01]	0.119 [0.01]	1	YES
Nickel	SW6020A	0.91 [0.1]	0.8 [0.1]	13	YES
Thallium	SW6020A	0.007 [0.01] J	ND [0.01]	35	Not applicable
Vanadium	SW6020A	2.6 [0.1]	2.54 [0.1]	2	YES
Zinc	SW6020A	86.6 [0.25]	82.9 [0.25]	4	YES
Methane	RSK175	650 [0.63]	680 [0.63]	5	YES
Sulfate	E300.0	131 [1]	137 [1]	4	YES
Iron	SW6010C	53100 [8]	53400 [8]	1	YES
1,1,2,2-Tetrachloroethane	SW8260C	34 [0.2]	25 [0.2]	31	NO
1,1,2-Trichloroethane	SW8260C	0.71 [0.4]	0.58 [0.4]	20	YES
1,1-Dichloroethane	SW8260C	0.87 [0.2]	0.77 [0.2]	12	YES
1,2,3-Trichlorobenzene	SW8260C	0.11 [0.4] J	ND [0.4]	114	Not applicable
1,2,4-Trichlorobenzene	SW8260C	0.16 [0.3] J	0.1 [0.3] J	46	Not applicable
1,2,4-Trimethylbenzene	SW8260C	0.09 [0.2] J	0.07 [0.2] J	25	Not applicable
1,2-Dichloroethane	SW8260C	1.8 [0.15]	1.6 [0.15]	12	YES
1,2-Dichloropropane	SW8260C	0.19 [0.2] J	ND [0.2]	5	Not applicable
Benzene	SW8260C	2.4 [0.1]	2.2 [0.1]	9	YES
Chloroethane	SW8260C	0.38 [0.2] J	0.26 [0.2] J	38	Not applicable
Chloromethane	SW8260C	0.19 [0.2] J	0.39 [0.2] J	69	Not applicable
cis-1,2-Dichloroethene	SW8260C	110 [1]	93 [1]	17	YES
Dichlorodifluoromethane	SW8260C	2 [0.2]	1.9 [0.2]	5	YES
Ethylbenzene	SW8260C	0.21 [0.1] J	0.16 [0.1] J	27	Not applicable
Hexachlorobutadiene	SW8260C	0.21 [0.3] J	ND [0.3]	35	Not applicable
Methylene chloride	SW8260C	0.12 [0.2] J	0.15 [0.2] J	22	Not applicable
n-Butylbenzene	SW8260C	0.09 [0.1] J	0.06 [0.1] J	40	Not applicable
o-Xylene	SW8260C	0.18 [0.2] J	0.19 [0.2] J	5	Not applicable
Tetrachloroethene (PCE)	SW8260C	0.21 [0.2] J	0.16 [0.2] J	27	Not applicable
Toluene	SW8260C	1 [0.1]	1.2 [0.1]	18	YES
trans-1,2-Dichloroethene	SW8260C	14 [0.2]	12 [0.2]	15	YES
Trichloroethene (TCE)	SW8260C	29 [0.1]	25 [0.1]	15	YES
Vinyl chloride	SW8260C	1.3 [0.1]	1.3 [0.1]	0	YES
Xylene, Isomers m & p	SW8260C	0.5 [0.2]	0.5 [0.2]	0	YES
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	ND [2.4]	ND [2.4]	0	Not applicable

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

[2] – The samples are associated with report K1607907.

[3] – The samples are associated with report K1612733.

2.8 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; however, only the discrepancies resulting in data qualification are described below. All discrepancies are discussed in detail in associated ADEC Laboratory Data Review Checklists.

- VOC CCV sample KWG1605890-2 associated with analytical batch KWG1605890 recovered below the control limit (± 20% recovery or drift) for bromoform (-21%) (report K1607907). All samples included in this SDG are associated with this batch and the bromoform results were qualified (J-) as estimates with a low bias. Impact to the results is negligible as the % drift failure was marginal (1% low) and the non-detect LODs were greater than two orders of magnitude below the cleanup level.
- The SVOC ICV sample associated with initial calibration CAL14822 recovered below the control limit (± 20% recovery or drift) for bis(2-chloroisopropyl) ether (-22%) (report K1607907). All samples included in this SDG are associated with this calibration and the bis(2-chloroisopropyl) ether results were qualified (J-) as estimates with a low bias. Impact to the results is negligible as recovery failure was marginal (2% low), no ADEC cleanup level is established, and the analyte is not a contaminant of concern.
- VOC CCV sample KWG1609849-2 associated with analytical batch KWG1609849 recovered above the control limit (± 20% recovery or drift) for bromomethane (+32%), chloroethane (+23%), cis-1,2-dichloroethene (+22%), bromochloromethane (+23%), and 1,1,2,2-tetrachloroethane (+23%) (report K1612733). All samples including in this SDG are associated with this batch and the following detected results were qualified (J+) as estimates with a high bias: chloroethane in samples 16FWOU417WG, 16FWOU419WG, and 16FWOU420WG; cis-1,2-dichloroethene in samples 16FWOU415WG, 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU419WG, 16FWOU420WG, 16FWOU421WG, and 16FWOU422WG; and 1,1,2,2-tetrachloroethane in samples 16FWOU417WG, 16FWOU419WG, and 16FWOU420WG. Impact to data is negligible as the results may be high-biased yet the majority of the detections were less than the ADEC cleanup levels. The exceptions are cis-1,2-dichloroethene and 1,1,2,2-tetrachloroethane in field duplicate pair 16FWOU419WG/16FWOU420WG, which have detections greater than the cleanup levels. However, impact to the project is negligible as the cis-1,2-dichloroethene and 1,1,2,2-tetrachloroethane results are consistent with historic results for this well (AP-8063).

2.9 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. 1,2,3-Trichloropropane and 1,2-dibromoethane (EDB) in all samples analyzed by 8260C and 3,3'-dichlorobenzidine, benzo(a)pyrene, dibenzo(a,h)anthracene, n-nitrosodi-n-propylamine, and pentachlorophenol in all samples analyzed by 8270D-LL did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345 (ADEC, 2016a). These analytes may not be detected, if present, at the respective cleanup level. However, impact to the project is not significant as the affected analytes are not OU4 contaminants of concern.

All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results table (Table C-2) presented in the Annual Sampling Report.

2.10 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 and no data were rejected pursuant to FES's data quality review.

Table B-4 below summarizes the qualified 2016 groundwater results associated with the sampling event at the OU4 sites, including the associated sample numbers, analytes, and the reason for qualification.

Table B-4 – Summary of Groundwater Data Qualifications

SDG	Sample Numbers	Analytes	Qualification	Explanation
K1607907	16FWOU413WQ	Iron	B	Method blank contamination
	16FWOU401WG 16FWOU402WG 16FWOU407WG	Silver		
	16FWOU401WG 16FWOU402WG	Naphthalene (VOC)		
	16FWOU403WG	n-Butylbenzene		
	16FWOU402WG 16FWOU403WG 16FWOU404WG 16FWOU405WG 16FWOU408WG 16FWOU409WG 16FWOU410WG 16FWOU412WG	Chloromethane	B	Trip blank contamination
	16FWOU401WG 16FWOU402WG 16FWOU409WG 16FWOU410WG	Toluene	B	Equipment blank contamination
	16FWOU410WG	Acetone		
	16FWOU402WG 16FWOU404WG	Ethylbenzene		
	16FWOU401WG 16FWOU402WG	o-Xylene		
	16FWOU409WG 16FWOU410WG	Nickel Bromodichloromethane trans-1,3-Dichloropropene Dibromochloromethane Bromoform 3,3′-Dichlorobenzidine	J-	Low-biased MS and/or MSD recovery
	16FWOU402WG	1,1,2,2-Tetrachloroethane Bromobenzene n-Propylbenzene 1,2,3-Trichloropropane 2-Chlorotoluene 1,3,5-Trimethylbenzene 2-Chlorotoluene 1,3,5-Trimethylbenzene 4-Chlorotoluene tert-Butylbenzene 4-Isopropyltoluene 1,3-Dichlorobenzene 1,4-Dichlorobenzene n-Butylbenzene 1,2-Dichlorobenzene 1,2-Dibromo-3-chloropropane 1,2,4-Trichlorobenzene Hexachlorobutadiene Naphthalene (VOC) 1,2,3-Trichlorobenzene	J-	Low-biased surrogate recovery
	16FWOU409WG 16FWOU410WG	bis(2-Ethylhexyl) phthalate	J	Field duplicate imprecision
	16FWOU401WG 16FWOU402WG 16FWOU403WG 16FWOU404WG 16FWOU405WG 16FWOU406WG 16FWOU407WG 16FWOU408WG 16FWOU409WG 16FWOU410WG 16FWOU411WG 16FWOU412WG 16FWOU413WQ 16FWOU414WQ	Bromoform	J-	Low-biased CCV recovery
		bis(2-chloroisopropyl) ether	J-	Low-biased ICV recovery

Table B-4 – Summary of Groundwater Data Qualifications (cont.)

SDG	Sample Numbers	Analytes	Qualification	Explanation
K1612733	16FWOU415WG 16FWOU424WQ	Chloroform	B	Method blank contamination
	16FWOU415WG 16FWOU417WG 16FWOU418WG 16FWOU419WG 16FWOU420WG 16FWOU424WQ	Methylene chloride		
	16FWOU415WG 16FWOU416WG 16FWOU418WG	Sulfate	B	Equipment blank contamination
	16FWOU415WG 16FWOU416WG 16FWOU417WG 16FWOU418WG 16FWOU421WG 16FWOU422WG	Antimony Chloromethane		
	16FWOU421WG	Barium 1,2,4-Trimethylbenzene m,p-Xylene o-Xylene		
	16FWOU416WG 16FWOU417WG 16FWOU418WG 16FWOU421WG 16FWOU422WG	Chromium		
	16FWOU416WG 16FWOU417WG	Cobalt Lead Zinc		
	16FWOU416WG	Copper		
	16FWOU416WG 16FWOU417WG 16FWOU418WG	Nickel		
	16FWOU415WG 16FWOU417WG	Cadmium		
	16FWOU415WG 16FWOU418WG 16FWOU421WG 16FWOU422WG	Toluene		
	16FWOU419WG 16FWOU420WG	1,1,2,2-Tetrachloroethane	J	Field duplicate imprecision
	16FWOU417WG 16FWOU419WG 16FWOU420WG	Chloroethane	J+	High-biased CCV recovery
	16FWOU415WG 16FWOU416WG 16FWOU417WG 16FWOU418WG 16FWOU419WG 16FWOU420WG 16FWOU421WG 16FWOU422WG	cis-1,2-Dichloroethene		
	16FWOU417WG 16FWOU419WG 16FWOU420WG	1,1,2,2-Tetrachloroethane		

2.11 Completeness

Completeness scores were calculated for each analytical method employed for the project. Scores were obtained by assigning points to 13 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-5 below. 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 2016 OU4 Annual Sampling Report.

Table B-5 – Completeness Scores for Groundwater Samples

Data Quality Category	**Points VOC**	**Points SVOC**	**Points Methane**	**Points Total 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	10	10	10	10	10	10
Method Blanks	9	10	10	9	9	10
Trip Blanks	9	NA	10	NA	NA	NA
Equipment Blank	9	10	10	9	10	9
LCS/LCSD Recovery & RPD	10	10	10	10	10	10
MS/MSD Recovery & RPD	9	9	10	9	10	10
Surrogate Recovery	9	10	NA	NA	NA	NA
Field Duplicate	9	9	10	10	10	10
Sensitivity (DL/LOD)	9	9	10	10	10	10
Total Points Received	123	117	120	107	109	109
Total Points Possible	130	120	120	110	110	110
Percent Completeness	95	98	100	97	99	99

NA – not applicable

3.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2016a. *18 AAC 75, Oil and Other Hazardous Substances Pollution Control*. May 8.

ADEC, 2016b. *Field Sampling Guidance*. March.

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

Department of Defense (DoD), 2013. *DoD Quality Systems Manual for Environmental Laboratories, Version 5.0.* July.

FES, 2016. *Final Postwide Uniform Federal Policy for Quality Assurance Project Plans, Fort Wainwright, Alaska.* August.

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: Rachel James

Title: Chemist, Argon, Inc.

Date: 12/26/2016

CS Report Name: Ft. Wainwright OU4

Report Date: 10/21/2016

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: ALS – Kelso, WA

Laboratory Report Number: K1607907

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 Method 300.0 and RSK175 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:

       Samples for methane analysis by RSK175 were transferred to ALS in Simi Valley, California.

2. Chain of Custody (COC)
    a. COC information completed, signed, and dated (including released/received by)?

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

       The second COC page from cooler 071301 was not signed upon receipt at the laboratory. The first page was signed and dated appropriately. Data quality was not impacted by this laboratory oversight.

    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:

       All coolers arrived at the laboratory containing temperature blanks with readings within the ADEC recommended temperature range of 0° to 6°C.

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 did not note any discrepancies.

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

Comments:

No data quality or usability was affected by the sample receipt documentation.

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 elevated LODs discussed below in 5d, LCS/LCSD and MS/MSD exceptions discussed below in 6d, and surrogate exceptions discussed below in 6c. It also discussed ICV and CCV exceptions and manual integrations, which are discussed here.

VOC CCV sample KWG1605890-2 associated with analytical batch KWG1605890 recovered below the control limit (± 20% recovery or drift) for bromoform (-21%). All samples are associated with this batch and the bromoform results were qualified (J-) as estimates with a low bias. Impact to the results is negligible as the % drift failure was marginal (1% low) and the non-detect LODs were greater than two orders of magnitude below the cleanup level.

The SVOC ICV sample associated with initial calibration CAL14822 recovered below the control limit (± 20% recovery or drift) for bis(2-chloroisopropyl) ether (-22%). All samples are associated with this calibration and the bis(2-chloroisopropyl) ether results were qualified (J-) as estimates with a low bias. Impact to the results is negligible as recovery failure was marginal (2% low), no ADEC cleanup level is established, and the analyte is not a contaminant of concern.

SVOC CCV sample KWG1606253-2 associated with analytical batch KWG1606253 recovered above the control limit (± 20% recovery or drift) for 4-chloro-3-methylphenol (+21%), 2-nitroaniline (+24%), and 2,4-dinitrotoluene (+22%). These analytes were not detected in the associated samples and qualifications due to the high recoveries were not necessary.

SVOC CCV sample KWG1606261-2 associated with analytical batch KWG1606261 recovered above the upper control limit (± 20% recovery or drift) for 2-nitroaniline (+22%). 2-Nitroaniline was not detected in the associated samples and qualifications due to the high recovery were not necessary.

SVOC CCV sample KWG1606262-2 associated with analytical batch KWG1606262 recovered above the upper control limit (± 20% recovery or drift) for n-nitrosodi-n-propylamine (+26%), 4-chloro-3-methylphenol (+24%), and 2-nitroaniline (+21%). These analytes were not detected in the associated samples and qualifications due to the high recoveries were not necessary.

Manual integrations were discussed for VOC and SVOC analyses. The laboratory stated that the integrations were done in accordance with internal policy. There were no effects on data quality or usability based upon the laboratory performing necessary manual integrations.

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 work order.

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. 1,2,3-Trichloropropane and 1,2-dibromoethane (EDB) in all samples analyzed by 8260C and 3,3’-dichlorobenzidine, benzo(a)pyrene, dibenzo(a,h)anthracene, n-nitrosodi-n-propylamine, and pentachlorophenol in all samples analyzed by 8270D-LL did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345. These analytes may not be detected, if present, at the respective cleanup level. However, impact to the project is not significant as the affected analytes are not contaminants of concern.

All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results table (Table C-2) presented in the Annual Sampling Report.

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, target analytes were detected below the LOQ in five method blank samples.

Iron was detected in method blank sample 267284LB (3.5µg/L) contained in extraction batch 267284 at a concentration below the LOQ (20µg/L). Iron was detected at a concentration less than five-times that of the method blank in associated equipment blank sample 16FWOU413WQ. This result was qualified (B) as potential laboratory cross-contamination. Impact to the project is negligible as the affected sample is a QC sample rather than a field sample and the result is of trace concentration (three to four orders of magnitude less than associated field samples).

Chromium (0.04µg/L) and silver (0.006µg/L) were detected in method blank sample 267288LB contained in extraction batch 267288 at concentrations below the LOQs (0.20µg/L and 0.020µg/L, respectively). Chromium was detected at a concentration less than five-times that of the method blank in associated equipment blank sample 16FWOU413WQ. Silver was detected at concentrations less than five-times that of the method blank in associated samples 16FWOU401WG, 16FWOU402WG, and 16FWOU407WG. These results were qualified (B) as potential laboratory cross-contamination. Impact to the results is negligible as the detections were more than three orders of magnitude below the ADEC cleanup level.

1,2,3-Trichlorobenzene (0.15µg/L), 1,2,4-tichlorobenzene (0.14µg/L), hexachlorobutadiene (0.15µg/L), naphthalene (0.090µg/L), and n-butylbenzene (0.070µg/L) were detected in VOC method blank sample KWG16058914 contained in extraction batch KWG1605891 at concentrations below the LOQs (all 2.0µg/L). Naphthalene was detected at concentrations less than five-times that of the method blank in associated samples 16FWOU401WG and 16FWOU402WG. n-Butylbenzene was detected at a concentration less than five-times that of the method blank in associated sample 16FWOU403WG. These results were qualified (B) as potential laboratory cross-contamination. Impact to the results is negligible as the detections were more than three orders of magnitude below the ADEC cleanup level.

Methane was detected in method blank sample P160725MB (0.43µg/L) contained in extraction batch FD10072516 and method blank sample P160726MB (0.31µg/L) contained in extraction batch FD10072616 at concentrations below the LOQ (both 1.3µg/L). Methane was either not detected or detected at concentrations greater than five-times that of the method blanks in all associated samples and qualifications were not necessary.

iii. If above PQL, what samples are affected?

Comments:

See 6aii above.

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 6aii above.

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:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

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

No project MS/MSD was reported in sulfate extraction batch 266582. Potential matrix interference in this batch could not be evaluated for this project; however, accuracy and precision for the batch was assessed from the LCS/LCSD samples and another client's MS/MSD. This batch contained results for samples 16FWOU401WG, 16FWOU402WG, 16FWOU403WG, 16FWOU404WG, 16FWOU405WG, 16FWOU406WG, and 16FWOU407WG.

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:

The iron MS/MSD samples prepared from 16FWOU409WG contained in extraction batch 267284 recovered below the control limits (60% and 50% vs. 87-115%). The iron result in the parent sample was greater than the spike concentration, so recovery criteria were not applicable. No qualifications were applied.

The nickel MS sample prepared from 16FWOU409WG contained in extraction batch 267288 recovered below the control limits (84% vs. 85-117%). The nickel results in parent sample 16FWOU409WG and associated field duplicate sample 16FWOU410WG were qualified (J-) as estimates with a low bias due to the low recovery. Impact to the results is negligible as the failure was marginal (1% low) and the detections were greater than one order of magnitude below the ADEC cleanup level.

The VOC MS and/or MSD samples prepared from 16FWOU409WG contained in extraction batch KWG1605891 recovered below the control limits for bromodichloromethane (78% vs. 79-125%), trans-1,3-dichloropropene (both 72% vs. 73-127%), dibromochloromethane (66% and 68% vs. 74-126%), and bromoform (63% vs. 66-130%). Additionally, 2-hexanone recovered above the control limits (142% and 146% vs. 57-139%). 2-Hexanone was not detected in the parent sample and qualification due to the high recoveries was not necessary. The bromodichloromethane, trans-1,3-dichloropropene, dibromochloromethane, and bromoform results in parent sample 16FWOU409WG and associated field duplicate sample 16FWOU410WG were qualified (J-) as estimates with a low bias due to the low recoveries. Impact to the results is negligible as the non-detect LODs were at least one order of magnitude below the ADEC cleanup levels.

The SVOC MS/MSD samples prepared from 16FWOU409WG contained in extraction batch KWG1605895 recovered below the control limits for 3,3'-dichlorobenzidine (19% and 24% vs. 27-129%). The 3,3-dichlorobenzidine results in parent sample 16FWOU409WG and associated field duplicate sample 16FWOU410WG were qualified (J-) as estimates with a low bias due to the low recoveries. Although the 3,3-dichlorobenzidine results may be biased low and the non-detect LODs are greater than the ADEC cleanup level, impact to the project is negligible as the analyte is not a contaminant of concern at this petroleum release site.

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:

SVOC LCS/LCSD samples KWG1605895-3/KWG1605895-4 contained in extraction batch KWG1605895 had an RPD above the laboratory limit (20%) for 3,3'-dichlorobenzidine (39%). 3,3'-Dichlorobenzidine was not detected in associated samples and qualification due to the LCS/LCSD imprecision was not necessary.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

See 6biii and 6biv above.

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 6biii and 6biv above.

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 4-bromofluorobenzene recovered below the control limits (85-114%) in sample 16FWOU402WG (84%). The VOC analytes associated with this surrogate (1,1,2,2-tetrachloroethane, bromobenzene, n-propylbenzene, 1,2,3-trichloropropane, 2-chlorotoluene, 1,3,5-trimethylbenzene, 2-chlorotoluene, 1,3,5-trimethylbenzene, 4-chlorotoluene, tert-butylbenzene, 4-isopropyltoluene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, n-butylbenzene, 1,2-dichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2,4-trichlorobenzene, hexachlorobutadiene, naphthalene, and 1,2,3-trichlorobenzene) were qualified (J-) as estimates with a low bias due to the low recovery. Impact to the results is negligible as the recovery failure was marginal (1% low) and most detections or non-detect LODs were a minimum of one order of magnitude below the ADEC cleanup level or no cleanup level was established. The exception is 1,2,3-trichloropropane, which had a non-detect LOD above the cleanup level; however, this analyte is not a site contaminant of concern.

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 6cii above.

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 16FWOU414WQ was included in cooler 071301.

iii. All results less than PQL?

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

No trip blank results were above the LOQ; however, chloromethane (0.090µg/L) was detected in the trip blank sample at a concentration below the LOQ (0.50µg/L). Chloromethane was detected at concentrations less than five-times that of the trip blank sample in associated samples 16FWOU402WG, 16FWOU403WG, 16FWOU404WG, 16FWOU405WG, 16FWOU408WG, 16FWOU409WG, 16FWOU410WG, and 16FWOU412WG. These results were qualified (B) as potential travel/storage cross-contamination. Impact to the project is negligible as the detections were greater than two orders of magnitude below the ADEC cleanup level.

iv. If above PQL, what samples are affected?

Comments:

See 6diii above.

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

Comments:

See 6diii above.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

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

Two groundwater field duplicates were collected for the ten groundwater primary samples associated with this work order.

ii. Submitted blind to lab?

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

Samples 16FWOU402WG and 16FWOU410WG were field duplicates of samples 16FWOU401WG and 16FWOU409WG, respectively.

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \text{ x } 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

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

All 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. Analytes that do not meet the comparison criteria are identified in gray shading and are discussed in the following paragraphs.

All results for the field duplicate/parent sample pair 16FWOU402WG/16FWOU401WG were comparable (RPD ≤ 30%) with the exception of chloromethane and ethylbenzene. Results for chloromethane and ethylbenzene were less than the LOQ and considered estimated values, so no flagging was applied.

All results for the field duplicate/parent sample pair 16FWOU410WG/16FWOU409WG were comparable (RPD ≤ 30%) with the exception of cadmium, acetone, carbon disulfide, chloromethane, bis-(2-ethylhexyl)phthalate, dimethyl phthalate, and phenol. Results for cadmium, acetone, carbon disulfide, chloromethane, dimethyl phthalate, and phenol were less than the LOQ and considered estimated values, so no flagging was applied. bis-2(Ethylhexyl)phthalate was reported above the LOQ in both samples. Consequently, these results in the field duplicate/parent sample pair were qualified (J) as estimates due to imprecision. Impact to the project is likely negligible as both the primary and field duplicate results were above the ADEC cleanup level, which is consistent with the previous two sampling events.

Analyte	Method	Primary 16FWOU401WG AP-10257MW	Field Duplicate 16FWOU402WG AP-5050	RPD, %	Comparable Criteria Met?
Antimony	SW6020A	0.433 [0.012]	0.456 [0.012]	5	YES
Arsenic	SW6020A	1.6 [0.3]	1.5 [0.3]	6	YES
Barium	SW6020A	387 [0.025]	388 [0.025]	0	YES
Beryllium	SW6020A	0.023 [0.02]	0.019 [0.02] J	19	YES
Cadmium	SW6020A	0.432 [0.02]	0.408 [0.02]	6	YES
Chromium	SW6020A	1.39 [0.05]	1.38 [0.05]	1	YES
Cobalt	SW6020A	20.1 [0.02]	20 [0.02]	0	YES
Copper	SW6020A	3.74 [0.05]	3.81 [0.05]	2	YES
Lead	SW6020A	0.091 [0.01]	0.095 [0.01]	4	YES
Nickel	SW6020A	71.3 [0.05]	70 [0.05]	2	YES
Selenium	SW6020A	0.9 [1] J	0.7 [1] J	25	Not applicable
Silver	SW6020A	0.011 [0.01] J	0.009 [0.01] J	20	Not applicable

Analyte	Method	Primary 16FWOU401WG AP-10257MW	Field Duplicate 16FWOU402WG AP-5050	RPD, %	Comparable Criteria Met?
Vanadium	SW6020A	2.73 [0.05]	2.72 [0.05]	0	YES
Zinc	SW6020A	50.7 [0.5]	51 [0.5]	1	YES
Methane	RSK175	1400 [0.63]	1500 [0.63]	7	YES
Sulfate	E300.0	3.4 [0.2]	3.4 [0.2]	0	YES
Iron	SW6010C	8130 [10]	8040 [10]	1	YES
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.2]	ND [0.2]	0	Not applicable
1,1,2-Trichloroethane	SW8260C	ND [0.4]	ND [0.4]	0	Not applicable
1,2,4-Trimethylbenzene	SW8260C	2.2 [0.2]	2 [0.2]	10	YES
1,2-Dichloroethane	SW8260C	0.3 [0.15] J	0.27 [0.15] J	11	Not applicable
1,3,5-Trimethylbenzene	SW8260C	0.33 [0.2] J	0.32 [0.2] J	3	Not applicable
4-Isopropyltoluene	SW8260C	0.31 [0.2] J	0.25 [0.2] J	21	Not applicable
Benzene	SW8260C	29 [0.1]	28 [0.1]	4	YES
Chloromethane	SW8260C	ND [0.2]	0.11 [0.2] J	58	Not applicable
cis-1,2-Dichloroethene	SW8260C	6.6 [0.2]	6.6 [0.2]	0	YES
Ethylbenzene	SW8260C	ND [0.1]	0.05 [0.1] J	67	Not applicable
Isopropylbenzene	SW8260C	2.1 [0.2]	1.9 [0.2] J	10	YES
Naphthalene	SW8260C	0.16 [0.3] J	0.17 [0.3] J	6	Not applicable
n-Butylbenzene	SW8260C	0.44 [0.1] J	0.43 [0.1] J	2	Not applicable
n-Propylbenzene	SW8260C	0.77 [0.2] J	0.74 [0.2] J	4	Not applicable
o-Xylene	SW8260C	0.45 [0.2] J	0.43 [0.2] J	5	Not applicable
sec-Butylbenzene	SW8260C	1.2 [0.1] J	1.1 [0.1] J	9	Not applicable
tert-Butylbenzene	SW8260C	0.12 [0.2] J	0.11 [0.2] J	9	Not applicable
Toluene	SW8260C	0.23 [0.1] J	0.25 [0.1] J	8	Not applicable
trans-1,2-Dichloroethene	SW8260C	1.1 [0.2]	1.1 [0.2]	0	YES
Trichloroethene (TCE)	SW8260C	0.15 [0.1] J	0.14 [0.1] J	7	Not applicable
Vinyl chloride	SW8260C	0.12 [0.1] J	0.12 [0.1] J	0	Not applicable
Xylene, Isomers m & p	SW8260C	2.1 [0.2]	2 [0.2]	5	YES
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	ND [1.9]	ND [1.9]	0	Not applicable
Analyte	**Method**	**Primary 16FWOU409WG AP-6532**	**Field Duplicate 16FWOU410WG AP-6060**	**RPD, %**	**Comparable Criteria Met?**
Antimony	SW6020A	1.45 [0.012]	1.31 [0.012]	10	YES
Arsenic	SW6020A	1.1 [0.3]	1.1 [0.3]	0	YES
Barium	SW6020A	251 [0.025]	253 [0.025]	1	YES
Beryllium	SW6020A	0.037 [0.02]	0.03 [0.02]	21	YES
Cadmium	SW6020A	0.017 [0.02] J	0.011 [0.02] J	43	Not applicable
Chromium	SW6020A	2.67 [0.05]	2.54 [0.05]	5	YES
Cobalt	SW6020A	0.247 [0.02]	0.211 [0.02]	16	YES
Copper	SW6020A	5.14 [0.05]	4.6 [0.05]	11	YES
Lead	SW6020A	2.09 [0.01]	1.94 [0.01]	7	YES
Nickel	SW6020A	2.51 [0.05]	1.98 [0.05]	24	YES
Vanadium	SW6020A	3.19 [0.05]	3.29 [0.05]	3	YES
Zinc	SW6020A	24.6 [0.5]	21 [0.5]	16	YES
Methane	RSK175	1200 [0.63]	1300 [0.63]	8	YES
Sulfate	E300.0	4.9 [0.2]	5 [0.2]	2	YES
Iron	SW6010C	28900 [10]	30300 [10]	5	YES
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.2]	ND [0.2]	0	Not applicable
1,1,2-Trichloroethane	SW8260C	ND [0.4]	ND [0.4]	0	Not applicable
1,1-Dichloroethane	SW8260C	0.13 [0.2] J	0.12 [0.2] J	8	Not applicable

Analyte	Method	Primary 16FWOU409WG AP-6532	Field Duplicate 16FWOU410WG AP-6060	RPD, %	Comparable Criteria Met?
1,2-Dichloroethane	SW8260C	0.28 [0.15] J	0.29 [0.15] J	4	Not applicable
Acetone	SW8260C	ND [10]	4.1 [10] J	84	Not applicable
Benzene	SW8260C	13 [0.1]	13 [0.1]	0	YES
Carbon disulfide	SW8260C	ND [0.2]	0.07 [0.2] J	96	Not applicable
Chloroform	SW8260C	0.11 [0.2] J	0.09 [0.2] J	20	Not applicable
Chloromethane	SW8260C	0.1 [0.2] J	0.18 [0.2] J	57	Not applicable
cis-1,2-Dichloroethene	SW8260C	3 [0.2]	3.1 [0.2]	3	YES
Dichlorodifluoromethane	SW8260C	0.68 [0.2]	0.65 [0.2]	5	YES
Toluene	SW8260C	0.21 [0.1] J	0.19 [0.1] J	10	Not applicable
trans-1,2-Dichloroethene	SW8260C	0.4 [0.2] J	0.42 [0.2] J	5	Not applicable
Trichloroethene (TCE)	SW8260C	ND [0.1]	ND [0.1]	0	Not applicable
Vinyl chloride	SW8260C	0.2 [0.1] J	0.22 [0.1] J	10	Not applicable
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	10 [1.9]	23 [1.9]	79	NO
Dimethyl phthalate	SW8270D-LL	2.5 [2] J	1.8 [2] J	33	Not applicable
Phenol	SW8270D-LL	0.76 [0.5] J	ND [0.5]	41	Not applicable

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

See 6eiii above.

f. Decontamination or Equipment Blank (If not used explain why).

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

Equipment blank sample 16FWOU413WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells were sampled with a submersible pump, per the UFP-QAPP, with the exception of monitoring wells AP-5588 (16FWOU411WG) and AP-8063 (16FWOU412WG). The casings of these wells are structurally damaged, which prohibits sampling with a submersible pump. Alternatively, these wells were sampled with a peristaltic pump employing new Teflon-lined tubing at each location. Therefore, the sample results associated with these wells were not compared to the equipment blank sample results.

i. All results less than PQL?

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

Iron was detected in the equipment blank sample at a concentration (3.7µg/L) below the LOQ (20µg/L). Iron was associated with method blank contamination and additional qualifications were not applied.

Barium was detected in the equipment blank sample at a concentration (0.084µg/L) above the LOQ (0.050µg/L). Additionally, chromium (0.10µg/L), copper (0.04µg/L), nickel (0.10µg/L), and vanadium (0.02µg/L) were detected at concentrations below the LOQs (0.20µg/L, 0.10µg/L, 0.20µg/L, and 0.20µg/L, respectively). Chromium was associated with method blank contamination and additional qualifications were not applied. Barium, copper, nickel, and vanadium were detected at concentrations greater than five-times that of the equipment blank and qualifications were not necessary.

Toluene was detected in the equipment blank sample at a concentration (0.84µg/L) above the LOQ (0.50µg/L). Additionally, acetone (7.3µg/L), benzene (0.080µg/L), ethylbenzene (0.060µg/L), m,p-xylene (0.21µg/L), and o-xylene (0.090µg/L) were detected at concentrations below the LOQs (20µg/L, 0.50µg/L, 0.50µg/L, 0.50µg/L, and 0.50µg/L, respectively). The following analytes were detected at concentrations less than five-times that of the equipment blank (ten-times for common laboratory contaminants) and were qualified (B) as potential sampling cross-contamination: toluene in samples 16FWOU401WG, 16FWOU402WG, 16FWOU409WG, and 16FWOU410WG; acetone in sample 16FWOU410WG; ethylbenzene in samples 16FWOU402WG and 16FWOU404WG; and o-xylene in samples 16FWOU401WG and 16FWOU402WG. Impact to the results is negligible as the detections were greater than three orders of magnitude below the ADEC cleanup levels.

ii. If above PQL, what samples are affected?

Comments:

See 6fi above.

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

Comments:

See 6fi above.

7. <u>Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)</u>

a. Defined and appropriate?

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

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc.   Date: 12/26/2016

CS Report Name: Ft. Wainwright OU4   Report Date: 12/01/2016

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: ALS – Kelso, WA   Laboratory Report Number: K1612733

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 Method 300.0 and RSK175 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:

      Samples for methane analysis by RSK175 were transferred to ALS in Simi Valley, California.

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:

      All coolers arrived at the laboratory containing temperature blanks with readings within the ADEC recommended temperature range of 0° to 6°C.

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 did not note any discrepancies.

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

Comments:

No data quality or usability was affected by the sample receipt documentation.

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 MS/MSD exceptions discussed below in 6d. It also discussed CCV exceptions and manual integrations, which are discussed here.

VOC CCV sample KWG1609849-2 associated with analytical batch KWG1609849 recovered above the control limit (± 20% recovery or drift) for bromomethane (+32%), chloroethane (+23%), cis-1,2-dichloroethene (+22%), bromochloromethane (+23%), and 1,1,2,2-tetrachloroethane (+23%). All samples are associated with this batch and the following detected results were qualified (J+) as estimates with a high bias: chloroethane in samples 16FWOU417WG, 16FWOU419WG, and 16FWOU420WG; cis-1,2-dichloroethene in samples 16FWOU415WG, 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU419WG, 16FWOU420WG, 16FWOU421WG, and 16FWOU422WG; and 1,1,2,2-tetrachloroethane in samples 16FWOU417WG, 16FWOU419WG, and 16FWOU420WG. Impact to the results is negligible as the results may be high-biased yet the majority of the detections were less than the ADEC cleanup levels. The exceptions are cis-1,2-dichloroethene and 1,1,2,2-tetrachloroethane in field duplicate pair 16FWOU419WG/16FWOU420WG, which have detections greater than the cleanup levels. However, impact to the project is negligible as the results are consistent with historic results for this well (AP-8063).

SVOC CCV sample KWG1610042-2 associated with analytical batch KWG1610042 recovered above the control limit (± 20% recovery or drift) for bis(2-chloroisopropyl) ether (+22%). bis(2-Chloroisopropyl) ether was not detected in the associated samples and qualifications due to the high recovery were not necessary.

Manual integrations were discussed for SVOC analyses. The laboratory stated that the integrations were done in accordance with internal policy. There were no effects on data quality or usability based upon the laboratory performing necessary manual integrations.

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. <u>Samples Results</u>

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 work order.

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. 1,2,3-Trichloropropane and 1,2-dibromoethane (EDB) in all samples analyzed by 8260C and 3,3'-dichlorobenzidine, benzo(a)pyrene, dibenzo(a,h)anthracene, n-nitrosodi-n-propylamine, and pentachlorophenol in all samples analyzed by 8270D-LL did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345. These analytes may not be detected, if present, at the respective cleanup level. However, impact to the project is not significant as the affected analytes are not contaminants of concern.

All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results table (Table C-2) presented in the Annual Sampling Report.

e. Data quality or usability affected?

Comments:

See discussion above in 5d.

6. QC Samples

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, target analytes were detected below the LOQ in one method blank sample.

Chloroform (0.080µg/L) and methylene chloride (0.14µg/L) were detected in method blank sample KWG16098504 contained in extraction batch KWG1609850 at concentrations below the LOQs (both 0.20µg/L). Chloroform was detected at a concentration less than five-times that of the method blank in associated sample 16FWOU415WG and trip blank sample 16FWOU424WQ. Methylene chloride (a common laboratory contaminant) was detected at concentrations less than ten-times that of the method blank in associated samples 16FWOU415WG, 16FWOU417WG, 16FWOU418WG, 16FWOU419WG, 16FWOU420WG, and trip blank sample 16FWOU424WQ. These results were qualified (B) as potential laboratory cross-contamination. Impact to the results is negligible as the detections were at least one order of magnitude below the ADEC cleanup levels.

iii. If above PQL, what samples are affected?

Comments:

See 6aii above.

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 6aii above.

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:

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:

The iron MS/MSD samples prepared from 16FWOU419WG contained in extraction batch 274660 recovered above the control limits (292% and 10% vs. 87-115%). The iron result in the parent sample was greater than the spike concentration, so recovery criteria were not applicable. No qualifications were applied.

The metals MS and/or MSD samples prepared from 16FWOU419WG contained in extraction batch 274662 recovered above the control limits for barium (130% and 134% vs. 64-114). The barium result in the parent sample was greater than the spike concentration, so recovery criteria were not applicable. No qualifications were applied.

The VOC MS/MSD samples prepared from 16FWOU419WG contained in extraction batch KWG1609850 recovered above the control limits for cis-1,2-dichloroethene (131% and 183% vs. 78-123%). The cis-1,2-dichloroethene result in the parent sample was greater than the spike concentration, so recovery criteria were not applicable. No qualifications were applied.

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:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

See 6biii above.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

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

Qualifications were not necessary.

vii. Data quality or usability affected? (Use comment box to explain.)
Comments:

Data quality or usability was not affected by the LCS/LCSD or MS/MSD samples.

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:

Qualifications were not necessary.

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

Data quality or usability was not affected by the surrogates.

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 16FWOU4124WQ was included in cooler 101901.

iii. All results less than PQL?
☐✓Yes No ☐NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, chloroform (0.10µg/L) and methylene chloride (0.14µg/L) were detected in the trip blank sample at concentrations below the LOQs (0.50µg/L and 2.0µg/L, respectively). These analytes were associated with method blank contamination and additional qualifications were not applied.

iv. If above PQL, what samples are affected?
Comments:

Not applicable.

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

Data quality or usability was not affected by the trip blank sample.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?
☐✓Yes No ☐NA (Please explain.) Comments:

One groundwater field duplicate was collected for the seven groundwater primary samples associated with this work order.

ii. Submitted blind to lab?
☐✓Yes No ☐NA (Please explain.) Comments:

Sample 16FWOU420WG was a field duplicate of sample 16FWOU419WG.

iii. Precision – All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%) = Absolute value of: } \frac{(R_1\text{-}R_2)}{((R_1+R_2)/2)} \text{ x } 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

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

All 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. Analytes that do not meet the comparison criteria are identified in gray shading and are discussed in the following paragraph.

All results for the field duplicate/parent sample pair 16FWOU419WG/16FWOU420WG were comparable (RPD ≤ 30%) with the exception of cadmium, thallium, 1,1,2,2-tetrachloroethane, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, chloroethane, chloromethane, hexachlorobutadiene, and n-butylbenzene. Results for cadmium, thallium, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, chloroethane, chloromethane, hexachlorobutadiene, and n-butylbenzene were less than the LOQ and considered estimated values, so no flagging was applied. 1,1,2,2-Tetrachloroethane was reported above the LOQ in both samples. Consequently, these results in the field duplicate/parent sample pair were qualified (J) as estimates due to imprecision. Impact to the 1,1,2,2-tetrachloroethane data is negligible as the RPD exceedance was marginal (1% high) and both results are within the typical concentration range observed at this well (AP-8063).

Analyte	**Method**	**Primary 16FWOU419WG AP-8063**	**Field Duplicate 16FWOU420WG AP-6060**	**RPD, %**	**Comparable Criteria Met?**
Antimony	SW6020A	0.118 [0.025]	0.106 [0.025]	11	YES
Arsenic	SW6020A	2.57 [0.13]	2.77 [0.13]	7	YES
Barium	SW6020A	713 [0.025]	748 [0.025]	5	YES
Beryllium	SW6020A	0.021 [0.02]	0.025 [0.02]	17	YES
Cadmium	SW6020A	0.02 [0.01] J	ND [0.01]	67	Not applicable
Chromium	SW6020A	1.16 [0.05]	1.09 [0.05]	6	YES
Cobalt	SW6020A	0.135 [0.02]	0.131 [0.02]	3	YES
Copper	SW6020A	0.25 [0.1]	0.25 [0.1]	0	YES
Lead	SW6020A	0.12 [0.01]	0.119 [0.01]	1	YES
Nickel	SW6020A	0.91 [0.1]	0.8 [0.1]	13	YES
Thallium	SW6020A	0.007 [0.01] J	ND [0.01]	35	Not applicable
Vanadium	SW6020A	2.6 [0.1]	2.54 [0.1]	2	YES
Zinc	SW6020A	86.6 [0.25]	82.9 [0.25]	4	YES
Methane	RSK175	650 [0.63]	680 [0.63]	5	YES
Sulfate	E300.0	131 [1]	137 [1]	4	YES
Iron	SW6010C	53100 [8]	53400 [8]	1	YES
1,1,2,2-Tetrachloroethane	SW8260C	34 [0.2]	25 [0.2]	31	NO
1,1,2-Trichloroethane	SW8260C	0.71 [0.4]	0.58 [0.4]	20	YES
1,1-Dichloroethane	SW8260C	0.87 [0.2]	0.77 [0.2]	12	YES
1,2,3-Trichlorobenzene	SW8260C	0.11 [0.4] J	ND [0.4]	114	Not applicable
1,2,4-Trichlorobenzene	SW8260C	0.16 [0.3] J	0.1 [0.3] J	46	Not applicable
1,2,4-Trimethylbenzene	SW8260C	0.09 [0.2] J	0.07 [0.2] J	25	Not applicable
1,2-Dichloroethane	SW8260C	1.8 [0.15]	1.6 [0.15]	12	YES
1,2-Dichloropropane	SW8260C	0.19 [0.2] J	ND [0.2]	5	Not applicable
Benzene	SW8260C	2.4 [0.1]	2.2 [0.1]	9	YES
Chloroethane	SW8260C	0.38 [0.2] J	0.26 [0.2] J	38	Not applicable
Chloromethane	SW8260C	0.19 [0.2] J	0.39 [0.2] J	69	Not applicable
cis-1,2-Dichloroethene	SW8260C	110 [1]	93 [1]	17	YES
Dichlorodifluoromethane	SW8260C	2 [0.2]	1.9 [0.2]	5	YES
Ethylbenzene	SW8260C	0.21 [0.1] J	0.16 [0.1] J	27	Not applicable
Hexachlorobutadiene	SW8260C	0.21 [0.3] J	ND [0.3]	35	Not applicable
Methylene chloride	SW8260C	0.12 [0.2] J	0.15 [0.2] J	22	Not applicable
n-Butylbenzene	SW8260C	0.09 [0.1] J	0.06 [0.1] J	40	Not applicable
o-Xylene	SW8260C	0.18 [0.2] J	0.19 [0.2] J	5	Not applicable
Tetrachloroethene (PCE)	SW8260C	0.21 [0.2] J	0.16 [0.2] J	27	Not applicable
Toluene	SW8260C	1 [0.1]	1.2 [0.1]	18	YES
trans-1,2-Dichloroethene	SW8260C	14 [0.2]	12 [0.2]	15	YES

Analyte	**Method**	**Primary 16FWOU419WG AP-8063**	**Field Duplicate 16FWOU420WG AP-6060**	**RPD, %**	**Comparable Criteria Met?**
Trichloroethene (TCE)	SW8260C	29 [0.1]	25 [0.1]	15	YES
Vinyl chloride	SW8260C	1.3 [0.1]	1.3 [0.1]	0	YES
Xylene, Isomers m & p	SW8260C	0.5 [0.2]	0.5 [0.2]	0	YES
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	ND [2.4]	ND [2.4]	0	Not applicable

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

See 6eiii above.

f. Decontamination or Equipment Blank (If not used explain why).

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

Equipment blank sample 16FWOU423WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells were sampled with a submersible pump, per the UFP-QAPP, with the exception of monitoring well AP-8063 (16FWOU419WG and 16FWOU420WG). The casing of this well is structurally damaged, which prohibits sampling with a submersible pump. Alternatively, this well was sampled with a peristaltic pump employing new Teflon-lined tubing. Therefore, the sample results associated with this well were not compared to the equipment blank sample results.

i. All results less than PQL?

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

Sulfate was detected in the equipment blank sample at a concentration (3.89mg/L) above the LOQ (0.20mg/L). Sulfate was detected at concentrations less than five-times that of the equipment blank in associated samples 16FWOU415WG, 16FWOU416WG, and 16FWOU418WG. These results were qualified (B) as potential sampling cross-contamination. Impact to the project is negligible as sulfate is used to monitor natural attenuation processes and the results are typically evaluated by changes in concentration by an order of magnitude.

Antimony (1.01µg/L), barium (18.0µg/L), chromium (0.57µg/L), cobalt (0.052µg/L), copper (0.18µg/L), lead (0.026µg/L), nickel (0.36µg/L), and zinc (0.94µg/L) were detected in the equipment blank sample at concentrations above the LOQs (0.050µg/L, 0.050µg/L, 0.20µg/L, 0.020µg/L, 0.10µg/L, 0.020µg/L, 0.20µg/L, and 0.50µg/L, respectively). Additionally, arsenic (0.07µg/L), cadmium (0.008µg/L), iron (14µg/L), and vanadium (0.12µg/L) were detected at concentrations below the LOQs (0.50µg/L, 0.020µg/L, 20µg/L, and 0.20µg/L, respectively). The following analytes were detected at concentrations less than five-times that of the equipment blank and were qualified (B) as potential sampling cross-contamination: antimony in samples 16FWOU415WG, 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG; barium in sample 16FWOU421WG; chromium in samples 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG; cobalt in samples 16FWOU416WG, and 16FWOU417WG; copper in sample 16FWOU416WG; lead in samples 16FWOU416WG and 16FWOU417WG; nickel in samples 16FWOU416WG, 16FWOU417WG, and 16FWOU418WG; zinc in samples 16FWOU416WG and 16FWOU417WG; and cadmium in samples 16FWOU415WG and 16FWOU417WG. Impact to the results is negligible as the detections were less than the ADEC cleanup levels or no cleanup level is established.

Toluene was detected in the equipment blank sample at a concentration (0.62µg/L) above the LOQ (0.50µg/L). Additionally, 1,2,4-trimethylbenzene (0.07µg/L), acetone (4.2µg/L), benzene (0.11µg/L), chloromethane (0.20µg/L), ethylbenzene (0.11µg/L), m,p-xylene (0.32µg/L), and o-xylene (0.12µg/L) were detected at concentrations below the LOQs (2µg/L, 20µg/L, 0.50µg/L, 0.50µg/L, 0.50µg/L, and 0.50µg/L, respectively). The following analytes were detected at concentrations less than five-times that of the equipment blank (ten-times for common laboratory contaminants) and were qualified (B) as potential sampling cross-contamination: toluene in samples 16FWOU415WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG; 1,2,4-trimethylbenzene in sample 16FWOU421WG; chloromethane in samples 16FWOU415WG, 16FWOU416WG, 16FWOU417WG, 16FWOU418WG, 16FWOU421WG, and 16FWOU422WG; and m,p-xylene and o-xylene in sample 16FWOU421WG. Impact to the results is negligible as the detections were at least two orders of magnitude below the ADEC cleanup levels.

ii. If above PQL, what samples are affected?

Comments:

See 6fi above.

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

Comments:

See 6fi above.

7. <u>Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)</u>
   a. Defined and appropriate?

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

No other data flags/qualifiers were used.

APPENDIX C

SAMPLE SUMMARY AND ANALYTICAL RESULTS TABLES

Table C-1 Groundwater Sample Summary
Operable Unit 4
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Type	Sampler Initials	Sample Date	Sample Time	VOC (8260C)	SVOC-LL (8270D-LL)	Methane (RSK-175)	Total Metals (6020A)	Iron (6010C)	Sulfate (300.0)	SDG	Cooler ID
Groundwater Samples													
16FWOU401WG	AP-10257MW	Primary	MB	7/11/2016	1000	X	X	X	X	X	X	K1607907	071301/02/05
16FWOU402WG	AP-5050	Field Duplicate of 16FWOU401WG	MB	7/11/2016	1100	X	X	X	X	X	X	K1607907	071301/02/05
16FWOU403WG	AP-10258MW	Primary	MB	7/11/2016	1230	X	X	X	X	X	X	K1607907	071301/02/05
16FWOU404WG	FWLF-4	Primary	MB	7/11/2016	1400	X	X	X	X	X	X	K1607907	071301/02/05
16FWOU405WG	AP-8061	Primary	MB	7/11/2016	1700	X	X	X	X	X	X	K1607907	071301/02/05
16FWOU406WG	AP-6530	Primary	MB	7/12/2016	1145	X	X	X	X	X	X	K1607907	071301/03/05
16FWOU407WG	AP-6535	Primary	MB	7/12/2016	1430	X	X	X	X	X	X	K1607907	071301/03/05
16FWOU408WG	AP-5589	Primary	CB/JK	7/12/2016	1350	X	X	X	X	X	X	K1607907	071301/03/05
16FWOU409WG	AP-6532	Primary/MS/MSD	CB	7/12/2016	1600	X	X	X	X	X	X	K1607907	071301/04/05
16FWOU410WG	AP-6060	Field Duplicate of 16FWOU409WG	CB	7/12/2016	1620	X	X	X	X	X	X	K1607907	071301/03/05
16FWOU411WG	AP-5588	Primary	JK	7/12/2016	1720	X	X	X	X	X	X	K1607907	071301/03/05
16FWOU412WG	AP-8063	Primary	MB	7/12/2016	1800	X	X	X	X	X	X	K1607907	071301/04/05
16FWOU415WG	AP-6532	Primary	JK	10/17/2016	1400	X	X	X	X	X	X	K1612733	101901/02/03
16FWOU416WG	AP-6530	Primary	JK	10/17/2016	1545	X	X	X	X	X	X	K1612733	101901/02/03
16FWOU417WG	AP-5589	Primary	JK	10/18/2016	1015	X	X	X	X	X	X	K1612733	101901/02/03
16FWOU418WG	AP-6535	Primary	JK	10/18/2016	1130	X	X	X	X	X	X	K1612733	101901/02/03
16FWOU419WG	AP-8063	Primary/MS/MSD	JK	10/18/2016	1315	X	X	X	X	X	X	K1612733	101901/02/04
16FWOU420WG	AP-6060	Field Duplicate of 16FWOU419WG	JK	10/18/2016	1345	X	X	X	X	X	X	K1612733	101901/02/03
16FWOU421WG	AP-10258MW	Primary	JK	10/18/2016	1515	X	X	X	X	X	X	K1612733	101901/02/04
16FWOU422WG	AP-10257MW	Primary	JK	10/18/2016	1630	X	X	X	X	X	X	K1612733	101901/02/04
Equipment Blanks													
16FWOU413WQ	Rinsate	Equipment Blank	MB	7/12/2016	1835	X	X	X	X	X	X	K1607907	071301/04/05
16FWOU423WQ	Rinsate 23	Equipment Blank	JK	10/18/2016	1900	X	X	X	X	X	X	K1612733	101901/02
Trip Blanks													
16FWOU414WQ	Trip Blank	Trip Blank	JK	7/11/2016	800	X		X				K1607907	071301
16FWOU424WQ	Trip Blank	Trip Blank	JK	10/17/2016	800	X		X				K1612733	101901

Note: All samples were submitted to and analyzed by ALS Environmental of Kelso, Washington (ALS). The standard 21-day turnaround time was requested for all analyses. All sampling was conducted under NPDL work order number 16-086.

CB - Chris Boese
HCl - hydrochloric acid
HDPE - high-density polyethene
HNO3 - nitric acid
JK - Josh Klynstra
MB - Mike Boese
mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
NPDL - North Pacific Division Laboratory
SDG - sample data group
SVOC - semi-volatile organic compounds
VOC - volatile organic compounds
VOA - volatile organic analysis

Water Sample Collection (all samples were field-preserved at 0 to 6°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	**16FWOU401WG**	**16FWOU402WG**	**16FWOU403WG**	**16FWOU404WG**	**16FWOU405WG**	**16FWOU406WG**	**16FWOU407WG**	**16FWOU408WG**	**16FWOU409WG**	**16FWOU410WG**	**16FWOU411WG**	**16FWOU412WG**	**16FWOU415WG**	**16FWOU416WG**
				Location ID	**AP-10257MW**	**"AP-5050"**	**AP-10258MW**	**FWLF-4**	**AP-8061**	**AP-6530**	**AP-6535**	**AP-5589**	**AP-6532**	**"AP-6060"**	**AP-5588**	**AP-8063**	**AP-6532**	**AP-6530**
				Sample Data Group	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1612733**	**K1612733**
				Laboratory ID	**160790701F**	**160790702F**	**160790703F**	**160790704F**	**160790705F**	**160790706F**	**160790707F**	**160790708F**	**160790709F**	**160790710F**	**160790711F**	**160790712F**	**K161273301**	**K161273302**
				Collection Date	**7/11/2016**	**7/11/2016**	**7/11/2016**	**7/11/2016**	**7/11/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**10/17/2016**	**10/17/2016**
				Matirx	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**
				Sample Type	**Primary**	**Field Duplicate 16FWOU401WG**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary/ MS/MSD**	**Field Duplicate 16FWOU409WG**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Method**	**Units**	**2016 ADEC Cleanup Level^1**	**2008 ADEC Cleanup Level^2**	**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	NE	1400 [0.63]	1500 [0.63]	360 [0.63]	43 [0.63]	92 [0.63]	15 [0.63]	220 [0.63]	740 [0.63]	1200 [0.63]	1300 [0.63]	430 [0.63]	520 [0.63]	1400 [0.63]	9.9 [0.63]
Sulfate	E300.0	mg/L	NE	NE	3.4 [0.2]	3.4 [0.2]	90.5 [0.2]	56.9 [0.2]	37.5 [0.2]	11.6 [0.2]	18.4 [0.2]	137 [0.4]	4.9 [0.2]	5 [0.2]	211 [1]	126 [0.4]	5.1 [0.2] B	9.5 [0.2] B
Iron	SW6010C	µg/L	NE	NE	8130 [10]	8040 [10]	1840 [10]	26400 [10]	29800 [10]	20400 [10]	27800 [10]	50200 [10]	28900 [10]	30300 [10]	42000 [10]	57900 [10]	27500 [8]	19000 [8]
Antimony	SW6020A	µg/L	7.8	6	0.433 [0.012]	0.456 [0.012]	1.1 [0.012]	0.053 [0.012]	0.081 [0.012]	0.109 [0.012]	0.557 [0.012]	0.066 [0.012]	1.45 [0.012]	1.31 [0.012]	0.072 [0.012]	0.2 [0.012]	0.797 [0.025] B	0.026 [0.025] J B
Arsenic	SW6020A	µg/L	0.52	10	1.6 [0.3]	1.5 [0.3]	0.4 [0.3] J	6.6 [0.3]	**10.4 [0.3]**	4.8 [0.3]	3.9 [0.3]	0.9 [0.3]	1.1 [0.3]	1.1 [0.3]	**12.4 [0.3]**	2.5 [0.3]	0.98 [0.13]	4.86 [0.13]
Barium	SW6020A	µg/L	3,800	2,000	387 [0.025]	388 [0.025]	96.9 [0.025]	324 [0.025]	575 [0.025]	315 [0.025]	283 [0.025]	606 [0.025]	251 [0.025]	253 [0.025]	500 [0.025]	677 [0.025]	241 [0.025]	326 [0.025]
Beryllium	SW6020A	µg/L	25	4	0.023 [0.02]	0.019 [0.02] J	0.054 [0.02]	ND [0.02]	0.018 [0.02] J	0.023 [0.02]	0.084 [0.02]	0.022 [0.02]	0.037 [0.02]	0.03 [0.02]	0.012 [0.02] J	0.028 [0.02]	0.037 [0.02]	0.017 [0.02] J
Cadmium	SW6020A	µg/L	9.2	5	0.432 [0.02]	0.408 [0.02]	0.518 [0.02]	0.034 [0.02]	ND [0.02]	0.019 [0.02] J	0.106 [0.02]	ND [0.02]	0.017 [0.02] J	0.011 [0.02] J	0.007 [0.02] J	0.019 [0.02] J	0.009 [0.01] J B	ND [0.01]
Chromium	SW6020A	µg/L	0.35^3	100	1.39 [0.05]	1.38 [0.05]	0.74 [0.05]	0.38 [0.05]	0.79 [0.05]	0.78 [0.05]	6.5 [0.05]	1.27 [0.05]	2.67 [0.05]	2.54 [0.05]	0.88 [0.05]	1.61 [0.05]	9.6 [0.05]	0.5 [0.05] B
Cobalt	SW6020A	µg/L	NE	NE	20.1 [0.02]	20 [0.02]	41.8 [0.02]	3.7 [0.02]	0.207 [0.02]	0.126 [0.02]	0.642 [0.02]	0.244 [0.02]	0.247 [0.02]	0.211 [0.02]	1.42 [0.02]	0.393 [0.02]	0.303 [0.02]	0.057 [0.02] B
Copper	SW6020A	µg/L	800	1,000	3.74 [0.05]	3.81 [0.05]	5.07 [0.05]	0.46 [0.05]	1.21 [0.05]	2.4 [0.05]	30.2 [0.05]	0.42 [0.05]	5.14 [0.05]	4.6 [0.05]	0.52 [0.05]	1.51 [0.05]	3.2 [0.1]	0.22 [0.1] B
Lead	SW6020A	µg/L	15	15	0.091 [0.01]	0.095 [0.01]	0.08 [0.01]	0.038 [0.01]	0.103 [0.01]	0.584 [0.01]	3.99 [0.01]	0.055 [0.01]	2.09 [0.01]	1.94 [0.01]	0.012 [0.01] J	1.06 [0.01]	1.04 [0.01]	0.06 [0.01] B
Nickel	SW6020A	µg/L	390	100	71.3 [0.05]	70 [0.05]	**145 [0.05]**	4.41 [0.05]	0.69 [0.05]	0.51 [0.05]	2.25 [0.05]	1.24 [0.05]	2.51 [0.05] J-	1.98 [0.05] J-	4.5 [0.05]	1.75 [0.05]	5.03 [0.1]	0.13 [0.1] J B
Selenium	SW6020A	µg/L	100	50	0.9 [1] J	0.7 [1] J	ND [1]	0.4 [1] J	ND [1]	ND [1]	ND [1]	0.6 [1] J	ND [1]	ND [1]	1 [1] J	0.6 [1] J	ND [1]	ND [1]
Silver	SW6020A	µg/L	94	100	0.011 [0.01] J B	0.009 [0.01] J B	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	0.012 [0.01] J B	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]
Thallium	SW6020A	µg/L	0.2	2	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.005]	ND [0.01]	ND [0.01]
Vanadium	SW6020A	µg/L	86	260	2.73 [0.05]	2.72 [0.05]	1.02 [0.05]	0.66 [0.05]	2.75 [0.05]	1.92 [0.05]	5.63 [0.05]	3.87 [0.05]	3.19 [0.05]	3.29 [0.05]	2.33 [0.05]	2.38 [0.05]	3.69 [0.1]	2.01 [0.1]
Zinc	SW6020A	µg/L	6,000	5,000	50.7 [0.5]	51 [0.5]	70.4 [0.5]	2.3 [0.5]	0.7 [0.5]	7.5 [0.5]	36.7 [0.5]	1.4 [0.5]	24.6 [0.5]	21 [0.5]	0.9 [0.5]	39.7 [0.5]	12.1 [0.25]	1.1 [0.25] B
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	200	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	4.3	ND [0.2]	ND [0.2] J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	**5.9 [0.2]**	ND [0.2]	ND [0.2]	**1400 [10]**	**21 [0.2]**	ND [0.2]	ND [0.2]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	5.0	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	**5.8 [2]**	0.53 [0.4]	ND [0.4]	ND [0.4]
1,1-Dichloroethane	SW8260C	µg/L	28	7,300	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.09 [0.2] J	ND [0.2]	0.12 [0.2] J	1.7 [0.2]	0.13 [0.2] J	0.12 [0.2] J	0.85 [1] J	0.71 [0.2]	0.12 [0.2] J	ND [0.2]
1,1-Dichloroethene	SW8260C	µg/L	280	7.0	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	0.08 [0.2] J	ND [0.2]	ND [0.2]
1,1-Dichloropropene	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	NE	ND [0.4]	ND [0.4] J-	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [2]	ND [0.4]	ND [0.4]	ND [0.4]
1,2,3-Trichloropropane	SW8260C	µg/L	0.01	0.12	ND [0.5]	ND [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 [2.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0	70	ND [0.3]	ND [0.3] J-	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [1.5]	ND [0.3]	ND [0.3]	ND [0.3]
1,2,4-Trimethylbenzene	SW8260C	µg/L	15	1,800	2.2 [0.2]	2 [0.2]	0.12 [0.2] J	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	NE	ND [0.8]	ND [0.8] J-	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [4]	ND [0.8]	ND [0.8]	ND [0.8]
1,2-Dibromoethane	SW8260C	µg/L	0.08	0.05	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,2-Dichlorobenzene	SW8260C	µg/L	300	600	ND [0.2]	ND [0.2] J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,2-Dichloroethane	SW8260C	µg/L	1.7	5.0	0.3 [0.15] J	0.27 [0.15] J	0.11 [0.15] J	ND [0.15]	0.3 [0.15] J	ND [0.15]	0.45 [0.15] J	2.9 [0.15]	0.28 [0.15] J	0.29 [0.15] J	2.2 [0.75] J	1.6 [0.15]	0.29 [0.15] J	ND [0.15]
1,2-Dichloropropane	SW8260C	µg/L	4.4	5.0	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.34 [0.2] J	ND [0.2]	ND [0.2]	ND [1]	0.17 [0.2] J	ND [0.2]	ND [0.2]
1,3,5-Trimethylbenzene	SW8260C	µg/L	120	1,800	0.33 [0.2] J	0.32 [0.2] J J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,3-Dichlorobenzene	SW8260C	µg/L	300	3,300	ND [0.2]	ND [0.2] J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,3-Dichloropropane	SW8260C	µg/L	4.7	8.5	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [1.5]	ND [0.3]	ND [0.3]	ND [0.3]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	75	ND [0.2]	ND [0.2] J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
2,2-Dichloropropane	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
2-Butanone	SW8260C	µg/L	5,600	22,000	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [20]	ND [4]	ND [4]	ND [4]
2-Chlorotoluene	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2] J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
2-Hexanone	SW8260C	µg/L	38	NE	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [50]	ND [10]	ND [10]	ND [10]
4-Chlorotoluene	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2] J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
4-Isopropyltoluene	SW8260C	µg/L	NE	NE	0.31 [0.2] J	0.25 [0.2] J J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	2,900	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [50]	ND [10]	ND [10]	ND [10]
Acetone	SW8260C	µg/L	14,000	33,000	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	4.1 [10] J B	ND [50]	ND [10]	ND [10]	ND [10]
Benzene	SW8260C	µg/L	4.6	5.0	**29 [0.1]**	**28 [0.1]**	**6.3 [0.1]**	1.9 [0.1]	3.5 [0.1]	1.7 [0.1]	3.4 [0.1]	3.9 [0.1]	**13 [0.1]**	**13 [0.1]**	2.2 [0.5] J	2.1 [0.1]	**13 [0.1]**	1.3 [0.1]
Bromobenzene	SW8260C	µg/L	62	NE	ND [0.2]	ND [0.2] J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Bromochloromethane	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Bromodichloromethane	SW8260C	µg/L	1.3	14	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3] J-	ND [0.3] J-	ND [1.5]	ND [0.3]	ND [0.3]	ND [0.3]
Bromoform	SW8260C	µg/L	33	110	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [2.5] J-	ND [0.5] J-	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	7.5	51	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [1.5]	ND [0.3]	ND [0.3]	ND [0.3]
Carbon disulfide	SW8260C	µg/L	810	3,700	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.07 [0.2] J	ND [1]	ND [0.2]	0.14 [0.2] J	ND [0.2]
Carbon tetrachloride	SW8260C	µg/L	4.6	5.0	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Chlorobenzene	SW8260C	µg/L	78	100	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Chloroethane	SW8260C	µg/L	21,000	290	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.3 [0.2] J	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Chloroform	SW8260C	µg/L	2.2	140	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.11 [0.2] J	0.09 [0.2] J	0.4 [1] J	ND [0.2]	0.38 [0.2] J B	ND [0.2]
Chloromethane	SW8260C	µg/L	190	66	ND [0.2]	0.11 [0.2] J B	0.08 [0.2] J B	0.1 [0.2] J B	0.13 [0.2] J B	ND [0.2]	2.8 [0.2]	0.19 [0.2] J B	0.1 [0.2] J B	0.18 [0.2] J B	ND [1]	0.15 [0.2] J B	0.14 [0.2] J B	0.21 [0.2] J B
cis-1,2-Dichloroethene	SW8260C	µg/L	36	70	6.6 [0.2]	6.6 [0.2]	4.4 [0.2]	0.62 [0.2]	8.2 [0.2]	0.18 [0.2] J	35 [0.2]	19 [0.2]	3 [0.2]	3.1 [0.2]	**160 [1]**	**110 [2]**	3 [0.2] J+	0.15 [0.2] J J+
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	8.5	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Dibromochloromethane	SW8260C	µg/L	8.7	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] J-	ND [0.5] J-	ND [2.5]	ND [0.5]	ND [0.5]	ND [0.5]

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

Sample ID					16FWOU401WG	16FWOU402WG	16FWOU403WG	16FWOU404WG	16FWOU405WG	16FWOU406WG	16FWOU407WG	16FWOU408WG	16FWOU409WG	16FWOU410WG	16FWOU411WG	16FWOU412WG	16FWOU415WG	16FWOU416WG
Location ID					AP-10257MW	"AP-5050"	AP-10258MW	FWLF-4	AP-8061	AP-6530	AP-6535	AP-5589	AP-6532	"AP-6060"	AP-5588	AP-8063	AP-6532	AP-6530
Sample Data Group					K1607907	K1607907	K1607907	K1607907	K1607907	K1607907	K1607907	K1607907	K1607907	K1607907	K1607907	K1607907	K1612733	K1612733
Laboratory ID					160790701F	160790702F	160790703F	160790704F	160790705F	160790706F	160790707F	160790708F	160790709F	160790710F	160790711F	160790712F	K161273301	K161273302
Collection Date					7/11/2016	7/11/2016	7/11/2016	7/11/2016	7/11/2016	7/12/2016	7/12/2016	7/12/2016	7/12/2016	7/12/2016	7/12/2016	7/12/2016	10/17/2016	10/17/2016
Matirx					WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Sample Type					Primary	Field Duplicate 16FWOU401WG	Primary	Primary	Primary	Primary	Primary	Primary	Primary/ MS/MSD	Field Duplicate 16FWOU409WG	Primary	Primary	Primary	Primary
Analyte	Method	Units	2016 ADEC Cleanup Level^1	2008 ADEC Cleanup Level^2	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
Dibromomethane	SW8260C	µg/L	8.3	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 [2.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	200	7,300	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.19 [0.2] J	ND [0.2]	0.82 [0.2]	3.8 [0.2]	0.68 [0.2]	0.65 [0.2]	1.4 [1] J	1.9 [0.2]	0.73 [0.2]	ND [0.2]
Ethylbenzene	SW8260C	µg/L	15	700	ND [0.1]	0.05 [0.1] J B	ND [0.1]	0.06 [0.1] J B	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.5]	ND [0.1]	ND [0.1]	ND [0.1]
Hexachlorobutadiene	SW8260C	µg/L	1.4	7.3	ND [0.3]	ND [0.3] J-	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [1.5]	ND [0.3]	ND [0.3]	ND [0.3]
Isopropylbenzene	SW8260C	µg/L	450	3,700	2.1 [0.2]	1.9 [0.2] J	0.3 [0.2] J	0.06 [0.2] J	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Methylene chloride	SW8260C	µg/L	110	5.0	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.14 [0.2] J	ND [0.2]	ND [0.2]	0.5 [1] J	ND [0.2]	0.15 [0.2] J B	ND [0.2]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	470	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [1.5]	ND [0.3]	ND [0.3]	ND [0.3]
Naphthalene	SW8260C	µg/L	1.7	730	0.16 [0.3] J B	0.17 [0.3] J B J-	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [1.5]	ND [0.3]	ND [0.3]	ND [0.3]
n-Butylbenzene	SW8260C	µg/L	1,000	370	0.44 [0.1] J	0.43 [0.1] J J-	0.07 [0.1] J B	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.5]	ND [0.1]	ND [0.1]	ND [0.1]
n-Propylbenzene	SW8260C	µg/L	660	370	0.77 [0.2] J	0.74 [0.2] J J-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
o-Xylene	SW8260C	µg/L	190	10,000	0.45 [0.2] J B	0.43 [0.2] J B	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
sec-Butylbenzene	SW8260C	µg/L	2,000	370	1.2 [0.1] J	1.1 [0.1] J	0.48 [0.1] J	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.5]	ND [0.1]	ND [0.1]	ND [0.1]
Styrene	SW8260C	µg/L	1,200	100	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
tert-Butylbenzene	SW8260C	µg/L	690	370	0.12 [0.2] J	0.11 [0.2] J J-	0.07 [0.2] J	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	5.0	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	2.1 [1] J	0.14 [0.2] J	ND [0.2]	ND [0.2]
Toluene	SW8260C	µg/L	1,100	1000	0.23 [0.1] J B	0.25 [0.1] J B	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	0.21 [0.1] J B	0.19 [0.1] J B	ND [0.5]	ND [0.1]	0.49 [0.1] J B	ND [0.1]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	100	1.1 [0.2]	1.1 [0.2]	0.38 [0.2] J	ND [0.2]	3.8 [0.2]	ND [0.2]	3.6 [0.2]	2.6 [0.2]	0.4 [0.2] J	0.42 [0.2] J	39 [1]	12 [0.2]	0.41 [0.2] J	ND [0.2]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	8.5	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2] J-	ND [0.2] J-	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Trichloroethene (TCE)	SW8260C	µg/L	2.8	5.0	0.15 [0.1] J	0.14 [0.1] J	0.11 [0.1] J	ND [0.1]	4.4 [0.1]	ND [0.1]	0.87 [0.1]	4.9 [0.1]	ND [0.1]	ND [0.1]	**210 [0.5]**	**24 [0.1]**	ND [0.1]	ND [0.1]
Trichlorofluoromethane	SW8260C	µg/L	5,200	11,000	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.16 [0.2] J	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
Vinyl chloride	SW8260C	µg/L	0.19	2.0	0.12 [0.1] J	0.12 [0.1] J	ND [0.1]	ND [0.1]	0.16 [0.1] J	ND [0.1]	1.2 [0.1]	1.1 [0.1]	0.2 [0.1] J	0.22 [0.1] J	0.95 [0.5] J	1.3 [0.1]	0.26 [0.1] J	ND [0.1]
Xylene, Isomers m & p	SW8260C	µg/L	190	10,000	2.1 [0.2]	2 [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [1]	ND [0.2]	ND [0.2]	ND [0.2]
1,2,4-Trichlorobenzene	SW8270D-LL	µg/L	4.0	70	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
1,2-Dichlorobenzene	SW8270D-LL	µg/L	300	600	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
1,3-Dichlorobenzene	SW8270D-LL	µg/L	300	3,300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
1,4-Dichlorobenzene	SW8270D-LL	µg/L	4.8	75	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2,4,5-Trichlorophenol	SW8270D-LL	µg/L	1,200	3,700	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2,4,6-Trichlorophenol	SW8270D-LL	µg/L	12	77	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	ND [1]
2,4-Dichlorophenol	SW8270D-LL	µg/L	46	110	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2,4-Dimethylphenol	SW8270D-LL	µg/L	360	730	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2.2]	ND [2]
2,4-Dinitrophenol	SW8270D-LL	µg/L	39	73	ND [25]	ND [25]	ND [25]	ND [25]	ND [25]	ND [25]	ND [26]	ND [25]	ND [25]	ND [25]	ND [26]	ND [25]	ND [27]	ND [25]
2,4-Dinitrotoluene	SW8270D-LL	µg/L	2.4	1.3	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	ND [1]
2,6-Dinitrotoluene	SW8270D-LL	µg/L	0.49	1.3	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2-Chloronaphthalene	SW8270D-LL	µg/L	750	2,900	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2-Chlorophenol	SW8270D-LL	µg/L	91	180	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2-Methyl-4,6-dinitrophenol	SW8270D-LL	µg/L	NE	NE	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [11]	ND [10]	ND [10]	ND [10]	ND [11]	ND [10]	ND [11]	ND [10]
2-Methylnaphthalene	SW8270D-LL	µg/L	36	150	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	0.7 [0.5] J	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2-Methylphenol (o-Cresol)	SW8270D-LL	µg/L	930	1,800	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2-Nitroaniline	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
2-Nitrophenol	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
3,3'-Dichlorobenzidine	SW8270D-LL	µg/L	1.3	1.9	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2] J-	ND [2] J-	ND [2.1]	ND [2]	ND [2.2]	ND [2]
3-Nitroaniline	SW8270D-LL	µg/L	NE	NE	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	ND [1]
4-Bromophenyl phenyl ether	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
4-Chloro-3-methylphenol	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
4-Chloroaniline	SW8270D-LL	µg/L	3.7	16	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2.2]	ND [2]
4-Chlorophenyl phenyl ether	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
4-Methylphenol (p-Cresol)	SW8270D-LL	µg/L	1,900	180	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Acenaphthene	SW8270D-LL	µg/L	530	2,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Acenaphthylene	SW8270D-LL	µg/L	260	2,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Anthracene	SW8270D-LL	µg/L	43	11,000	ND [0.61]	ND [0.61]	ND [0.61]	ND [0.61]	ND [0.61]	ND [0.61]	ND [0.62]	ND [0.61]	ND [0.61]	ND [0.61]	ND [0.63]	ND [0.61]	ND [0.65]	ND [0.61]
Benzo(a)anthracene	SW8270D-LL	µg/L	0.12	1.2	ND [0.59]	ND [0.59]	ND [0.59]	ND [0.59]	ND [0.59]	ND [0.59]	ND [0.6]	ND [0.59]	ND [0.59]	ND [0.59]	ND [0.61]	ND [0.59]	ND [0.63]	ND [0.59]
Benzo(a)pyrene	SW8270D-LL	µg/L	0.03	0.2	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	ND [1]
Benzo(b)fluoranthene	SW8270D-LL	µg/L	0.34	1.2	ND [0.58]	ND [0.58]	ND [0.58]	ND [0.58]	ND [0.58]	ND [0.58]	ND [0.59]	ND [0.58]	ND [0.58]	ND [0.58]	ND [0.6]	ND [0.58]	ND [0.62]	ND [0.58]
Benzo(g,h,i)perylene	SW8270D-LL	µg/L	0.26	1,100	ND [0.81]	ND [0.81]	ND [0.81]	ND [0.81]	ND [0.81]	ND [0.81]	ND [0.82]	ND [0.81]	ND [0.81]	ND [0.81]	ND [0.84]	ND [0.81]	ND [0.87]	ND [0.81]
Benzo(k)fluoranthene	SW8270D-LL	µg/L	0.8	12	ND [0.83]	ND [0.83]	ND [0.83]	ND [0.83]	ND [0.83]	ND [0.83]	ND [0.84]	ND [0.83]	ND [0.83]	ND [0.83]	ND [0.86]	ND [0.83]	ND [0.89]	ND [0.83]
Benzyl alcohol	SW8270D-LL	µg/L	2,000	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Benzyl butyl phthalate	SW8270D-LL	µg/L	160	7,300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
bis-(2-Chloroethoxy)methane	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
bis-(2-Chloroethyl)ether	SW8270D-LL	µg/L	0.14	0.77	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
bis(2-Chloroisopropyl)ether	SW8270D-LL	µg/L	NE	NE	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.51] J-	ND [0.5] J-	ND [0.5] J-	ND [0.5] J-	ND [0.52] J-	ND [0.5] J-	ND [0.54]	ND [0.5]
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	µg/L	56	6	ND [1.9]	ND [1.9]	ND [1.9]	ND [1.9]	ND [1.9]	ND [1.9]	ND [2]	ND [1.9]	**10 [1.9] J**	**23 [1.9] J**	ND [2]	ND [1.9]	4.4 [2.1] J	ND [1.9]

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

Sample ID					**16FWOU401WG**	**16FWOU402WG**	**16FWOU403WG**	**16FWOU404WG**	**16FWOU405WG**	**16FWOU406WG**	**16FWOU407WG**	**16FWOU408WG**	**16FWOU409WG**	**16FWOU410WG**	**16FWOU411WG**	**16FWOU412WG**	**16FWOU415WG**	**16FWOU416WG**
Location ID					**AP-10257MW**	**"AP-5050"**	**AP-10258MW**	**FWLF-4**	**AP-8061**	**AP-6530**	**AP-6535**	**AP-5589**	**AP-6532**	**"AP-6060"**	**AP-5588**	**AP-8063**	**AP-6532**	**AP-6530**
Sample Data Group					**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1607907**	**K1612733**	**K1612733**
Laboratory ID					**160790701F**	**160790702F**	**160790703F**	**160790704F**	**160790705F**	**160790706F**	**160790707F**	**160790708F**	**160790709F**	**160790710F**	**160790711F**	**160790712F**	**K161273301**	**K161273302**
Collection Date					**7/11/2016**	**7/11/2016**	**7/11/2016**	**7/11/2016**	**7/11/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**7/12/2016**	**10/17/2016**	**10/17/2016**
Matirx					**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**
Sample Type					**Primary**	**Field Duplicate 16FWOU401WG**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary/ MS/MSD**	**Field Duplicate 16FWOU409WG**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Method**	**Units**	**2016 ADEC Cleanup Level[1]**	**2008 ADEC Cleanup Level[2]**	**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**
Chrysene	SW8270D-LL	µg/L	2.0	120	ND [0.79]	ND [0.79]	ND [0.79]	ND [0.79]	ND [0.79]	ND [0.79]	ND [0.8]	ND [0.79]	ND [0.79]	ND [0.79]	ND [0.82]	ND [0.79]	ND [0.85]	ND [0.79]
Dibenzo(a,h)anthracene	SW8270D-LL	µg/L	0.03	0.12	ND [0.75]	ND [0.75]	ND [0.75]	ND [0.75]	ND [0.75]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.75]	ND [0.75]	ND [0.78]	ND [0.75]	ND [0.8]	ND [0.75]
Dibenzofuran	SW8270D-LL	µg/L	7.9	73	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Diethyl phthalate	SW8270D-LL	µg/L	15,000	29,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Dimethyl phthalate	SW8270D-LL	µg/L	16,000	370,000	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	2.5 [2] J	1.8 [2] J	ND [2.1]	ND [2]	ND [2.2]	ND [2]
Di-n-butyl phthalate	SW8270D-LL	µg/L	900	3,700	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.66]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.68]	ND [0.65]	ND [0.7]	ND [0.65]
Di-n-octyl phthalate	SW8270D-LL	µg/L	22	1,500	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.64]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.65]	ND [0.63]	ND [0.68]	ND [0.63]
Fluoranthene	SW8270D-LL	µg/L	260	1,500	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.66]	ND [0.65]	ND [0.65]	ND [0.65]	ND [0.68]	ND [0.65]	ND [0.7]	ND [0.65]
Fluorene	SW8270D-LL	µg/L	290	1,500	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Hexachlorobenzene	SW8270D-LL	µg/L	0.098	1.0	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.64]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.65]	ND [0.63]	ND [0.68]	ND [0.63]
Hexachlorobutadiene	SW8270D-LL	µg/L	1.4	7.3	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Hexachloroethane	SW8270D-LL	µg/L	3.3	40	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2.2]	ND [2]
Indeno(1,2,3-cd)pyrene	SW8270D-LL	µg/L	0.19	1.20	ND [0.68]	ND [0.68]	ND [0.68]	ND [0.68]	ND [0.68]	ND [0.68]	ND [0.69]	ND [0.68]	ND [0.68]	ND [0.68]	ND [0.71]	ND [0.68]	ND [0.73]	ND [0.68]
Isophorone	SW8270D-LL	µg/L	780	900	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	ND [1]
Naphthalene	SW8270D-LL	µg/L	1.7	730	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	3.6 [0.5] J	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Nitrobenzene	SW8270D-LL	µg/L	1.4	18	ND [0.57]	ND [0.57]	ND [0.57]	ND [0.57]	ND [0.57]	ND [0.57]	ND [0.58]	ND [0.57]	ND [0.57]	ND [0.57]	ND [0.59]	ND [0.57]	ND [0.61]	ND [0.57]
n-Nitrosodi-n-propylamine	SW8270D-LL	µg/L	0.11	0.12	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2]	ND [2]	ND [2.1]	ND [2]	ND [2.2]	ND [2]
n-Nitrosodiphenylamine	SW8270D-LL	µg/L	120	170	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Pentachlorophenol	SW8270D-LL	µg/L	0.41	1.0	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.1]	**9.9 [5] J**	ND [5]	ND [5]	ND [5.2]	ND [5]	ND [5.4]	ND [5]
Phenanthrene	SW8270D-LL	µg/L	170	11,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.54]	ND [0.5]
Phenol	SW8270D-LL	µg/L	5,800	11,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.51]	ND [0.5]	0.76 [0.5] J	ND [0.5]	ND [0.52]	ND [0.5]	1.3 [0.54] J	ND [0.5]
Pyrene	SW8270D-LL	µg/L	120	1,100	ND [0.73]	ND [0.73]	ND [0.73]	ND [0.73]	ND [0.73]	ND [0.73]	ND [0.74]	ND [0.73]	ND [0.73]	ND [0.73]	ND [0.76]	ND [0.73]	ND [0.78]	ND [0.73]

Yellow highlighted and **bolded** results exceed 2008 ADEC groundwater cleanup levels.

Grey highlighted results are non-detect with LODs above2008 ADEC cleanup levels.

[1] 2016 ADEC cleanup levels are Groundwater Human Health values listed in Title 18, Alaska Administrative Code, Section 75.345, Table C (effective November 6, 2016). These values are provided for comparative purposes only. LODs and results are compared to 2008 ADEC cleanup levels described in note 2.

[2] 2008 ADEC cleanup levels are listed in 18 AAC 75.345, Table C (revised as of May 8, 2016). These values are used for the purposes of the 2016 Monitoring Report and are equivalent to the Remedial Action Goals for site contaminants.

[3] Cleanup level is for hexavalent chromium

Data Qualifiers:

B - result may be due to cross-contamination
J - result is an estimate because it is less than the LOQ or due to a QC failure
J+ - result qualified as an estimate with a high-bias due to a QC failure
J- - result qualified as an 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
QC - quality control
WG - groundwater
WQ - water-matrix QC sample

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

				Sample ID	16FWOU417WG	16FWOU418WG	16FWOU419WG	16FWOU420WG	16FWOU421WG	16FWOU422WG	16FWOU413WQ	16FWOU423WQ	16FWOU414WQ	16FWOU424WQ
				Location ID	AP-5589	AP-6535	AP-8063	"AP-6060"	AP-10258MW	AP-10257MW	Rinsate	RINSATE 23	Trip Blank	TRIP BLANK
				Sample Data Group	K1612733	K1612733	K1612733	K1612733	K1612733	K1612733	K1607907	K1612733	K1607907	K1612733
				Laboratory ID	K161273303	K161273304	K161273305	K161273306	K161273307	K161273308	160790713F	K161273309	K160790714	K161273310
				Collection Date	10/18/2016	10/18/2016	10/18/2016	10/18/2016	10/18/2016	10/18/2016	7/12/2016	10/18/2016	7/11/2016	10/17/2016
				Matirx	WG	WG	WG	WG	WG	WG	WQ	WQ	WQ	WQ
				Sample Type	Primary	Primary	Primary/ MS/MSD	Field Duplicate 16FWOU419WG	Primary	Primary	Equipment Blank	Equipment Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**	**2016 ADEC Cleanup Level[1]**	**2008 ADEC Cleanup Level[2]**	**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	NE	610 [0.63]	240 [0.63]	650 [0.63]	680 [0.63]	430 [0.63]	620 [0.63]	ND [0.63]	ND [0.63]	ND [0.63]	ND [0.63]
Sulfate	E300.0	mg/L	NE	NE	133 [1]	17.5 [0.2] B	131 [1]	137 [1]	161 [1]	127 [1]	ND [0.04]	3.89 [0.04]	-	-
Iron	SW6010C	µg/L	NE	NE	49200 [8]	24200 [8]	53100 [8]	53400 [8]	255 [8]	3220 [8]	3.7 [10] J B	14 [8] J	-	-
Antimony	SW6020A	µg/L	7.8	6	0.111 [0.025] B	0.391 [0.025] B	0.118 [0.025]	0.106 [0.025]	0.886 [0.025] B	1.77 [0.025] B	ND [0.012]	1.01 [0.025]	-	-
Arsenic	SW6020A	µg/L	0.52	10	0.92 [0.13]	3.36 [0.13]	2.57 [0.13]	2.77 [0.13]	1.17 [0.13]	2.96 [0.13]	ND [0.3]	0.07 [0.13] J	-	-
Barium	SW6020A	µg/L	3,800	2,000	619 [0.025]	268 [0.025]	713 [0.025]	748 [0.025]	63.9 [0.025] B	254 [0.025]	0.084 [0.025]	18 [0.025]	-	-
Beryllium	SW6020A	µg/L	25	4	0.037 [0.02]	0.05 [0.02]	0.021 [0.02]	0.025 [0.02]	0.229 [0.02]	0.029 [0.02]	ND [0.02]	ND [0.02]	-	-
Cadmium	SW6020A	µg/L	9.2	5	0.011 [0.01] J B	0.047 [0.01]	0.02 [0.01] J	ND [0.01]	2.35 [0.01]	0.68 [0.01]	ND [0.02]	0.008 [0.01] J	-	-
Chromium	SW6020A	µg/L	0.35 [3]	100	1.73 [0.05] B	2.84 [0.05] B	1.16 [0.05]	1.09 [0.05]	0.98 [0.05] B	1.72 [0.05] B	0.1 [0.05] J	0.57 [0.05]	-	-
Cobalt	SW6020A	µg/L	NE	NE	0.157 [0.02] B	0.297 [0.02]	0.135 [0.02]	0.131 [0.02]	172 [0.02]	39.4 [0.02]	ND [0.02]	0.052 [0.02]	-	-
Copper	SW6020A	µg/L	800	1,000	1.14 [0.1]	10 [0.1]	0.25 [0.1]	0.25 [0.1]	13.2 [0.1]	10.1 [0.1]	0.04 [0.05] J	0.18 [0.1]	-	-
Lead	SW6020A	µg/L	15	15	0.065 [0.01] B	1.37 [0.01]	0.12 [0.01]	0.119 [0.01]	0.448 [0.01]	0.252 [0.01]	ND [0.01]	0.026 [0.01]	-	-
Nickel	SW6020A	µg/L	390	100	0.73 [0.1] B	0.99 [0.1] B	0.91 [0.1]	0.8 [0.1]	**338 [0.1]**	97.3 [0.1]	0.1 [0.05] J	0.36 [0.1]	-	-
Selenium	SW6020A	µg/L	100	50	ND [1]	ND [1]	ND [1]	ND [1]	0.8 [1] J	0.5 [1] J	ND [1]	ND [1]	-	-
Silver	SW6020A	µg/L	94	100	ND [0.01]	0.009 [0.01] J	ND [0.01]	ND [0.01]	0.018 [0.01] J	0.034 [0.01]	ND [0.01]	ND [0.01]	-	-
Thallium	SW6020A	µg/L	0.2	2	0.003 [0.01] J	0.004 [0.01] J	0.007 [0.01] J	ND [0.01]	0.078 [0.01]	0.037 [0.01]	ND [0.005]	ND [0.01]	-	-
Vanadium	SW6020A	µg/L	86	260	5.02 [0.1]	3.98 [0.1]	2.6 [0.1]	2.54 [0.1]	2.07 [0.1]	3.53 [0.1]	0.02 [0.05] J	0.12 [0.1] J	-	-
Zinc	SW6020A	µg/L	6,000	5,000	1.56 [0.25] B	13.2 [0.25]	86.6 [0.25]	82.9 [0.25]	298 [0.25]	34.4 [0.25]	ND [0.5]	0.94 [0.25]	-	-
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	200	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	4.3	2.7 [0.2] J+	ND [0.2]	**34 [0.2] J J+**	**25 [0.2] J J+**	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	5.0	ND [0.4]	ND [0.4]	0.71 [0.4]	0.58 [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,1-Dichloroethane	SW8260C	µg/L	28	7,300	1.9 [0.2]	0.13 [0.2] J	0.87 [0.2]	0.77 [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1-Dichloroethene	SW8260C	µg/L	280	7.0	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1-Dichloropropene	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	NE	ND [0.4]	ND [0.4]	0.11 [0.4] J	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,2,3-Trichloropropane	SW8260C	µg/L	0.01	0.12	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-Trichlorobenzene	SW8260C	µg/L	4.0	70	ND [0.3]	ND [0.3]	0.16 [0.3] J	0.1 [0.3] J	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]
1,2,4-Trimethylbenzene	SW8260C	µg/L	15	1,800	ND [0.2]	ND [0.2]	0.09 [0.2] J	0.07 [0.2] J	0.26 [0.2] J B	ND [0.2]	ND [0.2]	0.07 [0.2] J	ND [0.2]	ND [0.2]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	NE	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,2-Dibromoethane	SW8260C	µg/L	0.08	0.05	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,2-Dichlorobenzene	SW8260C	µg/L	300	600	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,2-Dichloroethane	SW8260C	µg/L	1.7	5.0	3.1 [0.15]	0.39 [0.15] J	1.8 [0.15]	1.6 [0.15]	0.08 [0.15] J	0.11 [0.15] J	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]
1,2-Dichloropropane	SW8260C	µg/L	4.4	5.0	0.33 [0.2] J	ND [0.2]	0.19 [0.2] J	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,3,5-Trimethylbenzene	SW8260C	µg/L	120	1,800	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,3-Dichlorobenzene	SW8260C	µg/L	300	3,300	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,3-Dichloropropane	SW8260C	µg/L	4.7	8.5	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	75	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
2,2-Dichloropropane	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
2-Butanone	SW8260C	µg/L	5,600	22,000	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]
2-Chlorotoluene	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
2-Hexanone	SW8260C	µg/L	38	NE	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]
4-Chlorotoluene	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
4-Isopropyltoluene	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	2,900	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]
Acetone	SW8260C	µg/L	14,000	33,000	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	7.3 [10] J	4.2 [10] J	ND [10]	ND [10]
Benzene	SW8260C	µg/L	4.6	5.0	4 [0.1]	2.9 [0.1]	2.4 [0.1]	2.2 [0.1]	**6 [0.1]**	**7.3 [0.1]**	0.08 [0.1] J	0.11 [0.1] J	ND [0.1]	ND [0.1]
Bromobenzene	SW8260C	µg/L	62	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Bromochloromethane	SW8260C	µg/L	NE	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Bromodichloromethane	SW8260C	µg/L	1.3	14	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]
Bromoform	SW8260C	µg/L	33	110	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5] J-	ND [0.5]	ND [0.5] J-	ND [0.5]
Bromomethane	SW8260C	µg/L	7.5	51	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]
Carbon disulfide	SW8260C	µg/L	810	3,700	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Carbon tetrachloride	SW8260C	µg/L	4.6	5.0	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Chlorobenzene	SW8260C	µg/L	78	100	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Chloroethane	SW8260C	µg/L	21,000	290	0.54 [0.2] J+	ND [0.2]	0.38 [0.2] J J+	0.26 [0.2] J J+	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Chloroform	SW8260C	µg/L	2.2	140	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.1 [0.2] J B
Chloromethane	SW8260C	µg/L	190	66	0.19 [0.2] J B	0.48 [0.2] J B	0.19 [0.2] J	0.39 [0.2] J	0.2 [0.2] J B	0.25 [0.2] J B	ND [0.2]	0.2 [0.2] J	0.09 [0.2] J	ND [0.2]
cis-1,2-Dichloroethene	SW8260C	µg/L	36	70	20 [0.2] J+	28 [0.2] J+	**110 [1] J+**	**93 [1] J+**	3.3 [0.2] J+	3.5 [0.2] J+	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	8.5	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Dibromochloromethane	SW8260C	µg/L	8.7	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]

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

Sample ID					16FWOU417WG	16FWOU418WG	16FWOU419WG	16FWOU420WG	16FWOU421WG	16FWOU422WG	16FWOU413WQ	16FWOU423WQ	16FWOU414WQ	16FWOU424WQ
Location ID					AP-5589	AP-6535	AP-8063	"AP-6060"	AP-10258MW	AP-10257MW	Rinsate	RINSATE 23	Trip Blank	TRIP BLANK
Sample Data Group					K1612733	K1612733	K1612733	K1612733	K1612733	K1612733	K1607907	K1612733	K1607907	K1612733
Laboratory ID					K161273303	K161273304	K161273305	K161273306	K161273307	K161273308	160790713F	K161273309	K160790714	K161273310
Collection Date					10/18/2016	10/18/2016	10/18/2016	10/18/2016	10/18/2016	10/18/2016	7/12/2016	10/18/2016	7/11/2016	10/17/2016
Matirx					WG	WG	WG	WG	WG	WG	WQ	WQ	WQ	WQ
Sample Type					Primary	Primary	Primary/ MS/MSD	Field Duplicate 16FWOU419WG	Primary	Primary	Equipment Blank	Equipment Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**	**2016 ADEC Cleanup Level^1**	**2008 ADEC Cleanup Level^2**	**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**
Dibromomethane	SW8260C	µg/L	8.3	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]
Dichlorodifluoromethane	SW8260C	µg/L	200	7,300	3.7 [0.2]	0.74 [0.2]	2 [0.2]	1.9 [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Ethylbenzene	SW8260C	µg/L	15	700	ND [0.1]	ND [0.1]	0.21 [0.1] J	0.16 [0.1] J	ND [0.1]	ND [0.1]	0.06 [0.1] J	0.11 [0.1] J	ND [0.1]	ND [0.1]
Hexachlorobutadiene	SW8260C	µg/L	1.4	7.3	ND [0.3]	ND [0.3]	0.21 [0.3] J	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]
Isopropylbenzene	SW8260C	µg/L	450	3,700	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.13 [0.2] J	0.08 [0.2] J	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Methylene chloride	SW8260C	µg/L	110	5.0	0.19 [0.2] J B	0.1 [0.2] J B	0.12 [0.2] J B	0.15 [0.2] J B	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	0.14 [0.2] J B
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	470	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]
Naphthalene	SW8260C	µg/L	1.7	730	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]
n-Butylbenzene	SW8260C	µg/L	1,000	370	ND [0.1]	ND [0.1]	0.09 [0.1] J	0.06 [0.1] J	0.08 [0.1] J	0.11 [0.1] J	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]
n-Propylbenzene	SW8260C	µg/L	660	370	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
o-Xylene	SW8260C	µg/L	190	10,000	ND [0.2]	ND [0.2]	0.18 [0.2] J	0.19 [0.2] J	0.19 [0.2] J B	ND [0.2]	0.09 [0.2] J	0.12 [0.2] J	ND [0.2]	ND [0.2]
sec-Butylbenzene	SW8260C	µg/L	2,000	370	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	0.2 [0.1] J	0.41 [0.1] J	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]
Styrene	SW8260C	µg/L	1,200	100	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
tert-Butylbenzene	SW8260C	µg/L	690	370	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	5.0	ND [0.2]	ND [0.2]	0.21 [0.2] J	0.16 [0.2] J	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Toluene	SW8260C	µg/L	1,100	1000	ND [0.1]	0.12 [0.1] J B	1 [0.1]	1.2 [0.1]	0.1 [0.1] J B	0.08 [0.1] J B	0.84 [0.1]	0.62 [0.1]	ND [0.1]	ND [0.1]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	100	2.7 [0.2]	2.6 [0.2]	14 [0.2]	12 [0.2]	0.25 [0.2] J	0.51 [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	8.5	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Trichloroethene (TCE)	SW8260C	µg/L	2.8	5.0	**5.1 [0.1]**	0.66 [0.1]	**29 [0.1]**	**25 [0.1]**	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]
Trichlorofluoromethane	SW8260C	µg/L	5,200	11,000	0.16 [0.2] J	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Vinyl chloride	SW8260C	µg/L	0.19	2.0	1.3 [0.1]	1.1 [0.1]	1.3 [0.1]	1.3 [0.1]	ND [0.1]	0.1 [0.1] J	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]
Xylene, Isomers m & p	SW8260C	µg/L	190	10,000	ND [0.2]	ND [0.2]	0.5 [0.2]	0.5 [0.2]	0.19 [0.2] J B	ND [0.2]	0.21 [0.2] J	0.32 [0.2] J	ND [0.2]	ND [0.2]
1,2,4-Trichlorobenzene	SW8270D-LL	µg/L	4.0	70	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
1,2-Dichlorobenzene	SW8270D-LL	µg/L	300	600	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
1,3-Dichlorobenzene	SW8270D-LL	µg/L	300	3,300	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
1,4-Dichlorobenzene	SW8270D-LL	µg/L	4.8	75	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2,4,5-Trichlorophenol	SW8270D-LL	µg/L	1,200	3,700	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2,4,6-Trichlorophenol	SW8270D-LL	µg/L	12	77	ND [1]	ND [1.1]	ND [1.3]	ND [1.3]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	-	-
2,4-Dichlorophenol	SW8270D-LL	µg/L	46	110	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2,4-Dimethylphenol	SW8270D-LL	µg/L	360	730	ND [2]	ND [2.1]	ND [2.5]	ND [2.5]	ND [2]	ND [2.1]	ND [2]	ND [2.1]	-	-
2,4-Dinitrophenol	SW8270D-LL	µg/L	39	73	ND [25]	ND [26]	ND [31]	ND [32]	ND [25]	ND [26]	ND [25]	ND [26]	-	-
2,4-Dinitrotoluene	SW8270D-LL	µg/L	2.4	1.3	ND [1]	ND [1.1]	ND [1.3]	ND [1.3]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	-	-
2,6-Dinitrotoluene	SW8270D-LL	µg/L	0.49	1.3	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2-Chloronaphthalene	SW8270D-LL	µg/L	750	2,900	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2-Chlorophenol	SW8270D-LL	µg/L	91	180	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2-Methyl-4,6-dinitrophenol	SW8270D-LL	µg/L	NE	NE	ND [10]	ND [11]	ND [13]	ND [13]	ND [10]	ND [11]	ND [10]	ND [11]	-	-
2-Methylnaphthalene	SW8270D-LL	µg/L	36	150	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2-Methylphenol (o-Cresol)	SW8270D-LL	µg/L	930	1,800	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2-Nitroaniline	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
2-Nitrophenol	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
3,3'-Dichlorobenzidine	SW8270D-LL	µg/L	1.3	1.9	ND [2]	ND [2.1]	ND [2.5]	ND [2.5]	ND [2]	ND [2.1]	ND [2]	ND [2.1]	-	-
3-Nitroaniline	SW8270D-LL	µg/L	NE	NE	ND [1]	ND [1.1]	ND [1.3]	ND [1.3]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	-	-
4-Bromophenyl phenyl ether	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
4-Chloro-3-methylphenol	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
4-Chloroaniline	SW8270D-LL	µg/L	3.7	16	ND [2]	ND [2.1]	ND [2.5]	ND [2.5]	ND [2]	ND [2.1]	ND [2]	ND [2.1]	-	-
4-Chlorophenyl phenyl ether	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
4-Methylphenol (p-Cresol)	SW8270D-LL	µg/L	1,900	180	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Acenaphthene	SW8270D-LL	µg/L	530	2,200	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Acenaphthylene	SW8270D-LL	µg/L	260	2,200	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Anthracene	SW8270D-LL	µg/L	43	11,000	ND [0.61]	ND [0.63]	ND [0.75]	ND [0.77]	ND [0.61]	ND [0.63]	ND [0.61]	ND [0.63]	-	-
Benzo(a)anthracene	SW8270D-LL	µg/L	0.12	1.2	ND [0.59]	ND [0.61]	ND [0.72]	ND [0.74]	ND [0.59]	ND [0.61]	ND [0.59]	ND [0.61]	-	-
Benzo(a)pyrene	SW8270D-LL	µg/L	0.03	0.2	ND [1]	ND [1.1]	ND [1.3]	ND [1.3]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	-	-
Benzo(b)fluoranthene	SW8270D-LL	µg/L	0.34	1.2	ND [0.58]	ND [0.6]	ND [0.71]	ND [0.73]	ND [0.58]	ND [0.6]	ND [0.58]	ND [0.6]	-	-
Benzo(g,h,i)perylene	SW8270D-LL	µg/L	0.26	1,100	ND [0.81]	ND [0.83]	ND [0.99]	ND [1.1]	ND [0.81]	ND [0.83]	ND [0.81]	ND [0.83]	-	-
Benzo(k)fluoranthene	SW8270D-LL	µg/L	0.8	12	ND [0.83]	ND [0.85]	ND [1.1]	ND [1.1]	ND [0.83]	ND [0.85]	ND [0.83]	ND [0.85]	-	-
Benzyl alcohol	SW8270D-LL	µg/L	2,000	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Benzyl butyl phthalate	SW8270D-LL	µg/L	160	7,300	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
bis-(2-Chloroethoxy)methane	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
bis-(2-Chloroethyl)ether	SW8270D-LL	µg/L	0.14	0.77	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
bis(2-Chloroisopropyl)ether	SW8270D-LL	µg/L	NE	NE	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5] J-	ND [0.52]	-	-
bis-(2-Ethylhexyl)phthalate	SW8270D-LL	µg/L	56	6	ND [1.9]	ND [2]	ND [2.4]	ND [2.4]	ND [1.9]	ND [2]	ND [1.9]	ND [2]	-	-

Table C-2 Groundwater Sample Results
Operable Unit 4
Fort Wainwright, Alaska

				Sample ID	16FWOU417WG	16FWOU418WG	16FWOU419WG	16FWOU420WG	16FWOU421WG	16FWOU422WG	16FWOU413WQ	16FWOU423WQ	16FWOU414WQ	16FWOU424WQ
				Location ID	AP-5589	AP-6535	AP-8063	"AP-6060"	AP-10258MW	AP-10257MW	Rinsate	RINSATE 23	Trip Blank	TRIP BLANK
				Sample Data Group	K1612733	K1612733	K1612733	K1612733	K1612733	K1612733	K1607907	K1612733	K1607907	K1612733
				Laboratory ID	K161273303	K161273304	K161273305	K161273306	K161273307	K161273308	160790713F	K161273309	K160790714	K161273310
				Collection Date	10/18/2016	10/18/2016	10/18/2016	10/18/2016	10/18/2016	10/18/2016	7/12/2016	10/18/2016	7/11/2016	10/17/2016
				Matirx	WG	WG	WG	WG	WG	WG	WQ	WQ	WQ	WQ
				Sample Type	Primary	Primary	Primary/ MS/MSD	Field Duplicate 16FWOU419WG	Primary	Primary	Equipment Blank	Equipment Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**	**2016 ADEC Cleanup Level[1]**	**2008 ADEC Cleanup Level[2]**	**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**
Chrysene	SW8270D-LL	μg/L	2.0	120	ND [0.79]	ND [0.81]	ND [0.97]	ND [0.99]	ND [0.79]	ND [0.81]	ND [0.79]	ND [0.81]	-	-
Dibenzo(a,h)anthracene	SW8270D-LL	μg/L	0.03	0.12	ND [0.75]	ND [0.77]	ND [0.92]	ND [0.94]	ND [0.75]	ND [0.77]	ND [0.75]	ND [0.77]	-	-
Dibenzofuran	SW8270D-LL	μg/L	7.9	73	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Diethyl phthalate	SW8270D-LL	μg/L	15,000	29,000	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Dimethyl phthalate	SW8270D-LL	μg/L	16,000	370,000	ND [2]	ND [2.1]	ND [2.5]	ND [2.5]	ND [2]	ND [2.1]	ND [2]	ND [2.1]	-	-
Di-n-butyl phthalate	SW8270D-LL	μg/L	900	3,700	ND [0.65]	ND [0.67]	ND [0.8]	ND [0.82]	ND [0.65]	ND [0.67]	ND [0.65]	ND [0.67]	-	-
Di-n-octyl phthalate	SW8270D-LL	μg/L	22	1,500	ND [0.63]	ND [0.65]	ND [0.77]	ND [0.79]	ND [0.63]	ND [0.65]	ND [0.63]	ND [0.65]	-	-
Fluoranthene	SW8270D-LL	μg/L	260	1,500	ND [0.65]	ND [0.67]	ND [0.8]	ND [0.82]	ND [0.65]	ND [0.67]	ND [0.65]	ND [0.67]	-	-
Fluorene	SW8270D-LL	μg/L	290	1,500	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Hexachlorobenzene	SW8270D-LL	μg/L	0.098	1.0	ND [0.63]	ND [0.65]	ND [0.77]	ND [0.79]	ND [0.63]	ND [0.65]	ND [0.63]	ND [0.65]	-	-
Hexachlorobutadiene	SW8270D-LL	μg/L	1.4	7.3	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Hexachloroethane	SW8270D-LL	μg/L	3.3	40	ND [2]	ND [2.1]	ND [2.5]	ND [2.5]	ND [2]	ND [2.1]	ND [2]	ND [2.1]	-	-
Indeno(1,2,3-cd)pyrene	SW8270D-LL	μg/L	0.19	1.20	ND [0.68]	ND [0.7]	ND [0.83]	ND [0.85]	ND [0.68]	ND [0.7]	ND [0.68]	ND [0.7]	-	-
Isophorone	SW8270D-LL	μg/L	780	900	ND [1]	ND [1.1]	ND [1.3]	ND [1.3]	ND [1]	ND [1.1]	ND [1]	ND [1.1]	-	-
Naphthalene	SW8270D-LL	μg/L	1.7	730	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Nitrobenzene	SW8270D-LL	μg/L	1.4	18	ND [0.57]	ND [0.59]	ND [0.7]	ND [0.72]	ND [0.57]	ND [0.59]	ND [0.57]	ND [0.59]	-	-
n-Nitrosodi-n-propylamine	SW8270D-LL	μg/L	0.11	0.12	ND [2]	ND [2.1]	ND [2.5]	ND [2.5]	ND [2]	ND [2.1]	ND [2]	ND [2.1]	-	-
n-Nitrosodiphenylamine	SW8270D-LL	μg/L	120	170	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Pentachlorophenol	SW8270D-LL	μg/L	0.41	1.0	ND [5]	ND [5.2]	ND [6.1]	ND [6.3]	ND [5]	ND [5.2]	ND [5]	ND [5.2]	-	-
Phenanthrene	SW8270D-LL	μg/L	170	11,000	ND [0.5]	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Phenol	SW8270D-LL	μg/L	5,800	11,000	0.41 [0.5] J	ND [0.52]	ND [0.61]	ND [0.63]	ND [0.5]	ND [0.52]	ND [0.5]	ND [0.52]	-	-
Pyrene	SW8270D-LL	μg/L	120	1,100	ND [0.73]	ND [0.75]	ND [0.9]	ND [0.92]	ND [0.73]	ND [0.75]	ND [0.73]	ND [0.75]	-	-

Yellow highlighted and **bolded** results exceed 2008 ADEC groundwater cleanup levels.

Grey highlighted results are non-detect with LODs above2008 ADEC cleanup levels.

[1] 2016 ADEC cleanup levels are Groundwater Human Health values listed in Title 18, Alaska Administrative Code, Section 75.345, Table C (effective November 6, 2016). These values are provided for comparative purposes only. LODs and results are compared to 2008 ADEC cleanup levels described in note 2.

[2] 2008 ADEC cleanup levels are listed in 18 AAC 75.345, Table C (revised as of May 8, 2016). These values are used for the purposes of the 2016 Monitoring Report and are equivalent to the Remedial Action Goals for site contaminants.

[3] Cleanup level is for hexavalent chromium

Data Qualifiers:

B - result may be due to cross-contamination

J - result is an estimate because it is less than the LOQ or due to a QC failure

J+ - result qualified as an estimate with a high-bias due to a QC failure

J- - result qualified as an 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

QC - quality control

WG - groundwater

WQ - water-matrix QC sample

APPENDIX D

MAROS

MAROS Statistical Trend Analysis Summary

Project: OU4 2016

Location: Fort Wainwright

User Name: FES

State: Alaska

Time Period: 7/1/1997 **to** 10/1/2016

Consolidation Period: No Time Consolidation

Consolidation Type: Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
1,1,2,2-TETRACHLOROETHANE								
AP-5588	S	35	35	1.8E+00	1.8E+00	No	PD	D
AP-5589	S	36	20	2.2E-03	2.7E-04	No	PI	PI
AP-8063	T	27	26	2.6E-02	2.1E-02	No	NT	NT
1,1,2-TRICHLOROETHANE								
AP-5588	S	35	35	1.1E-02	9.5E-03	No	D	PD
BENZENE								
AP-10257	S	8	8	1.2E-02	1.1E-02	No	NT	NT
AP-10258	S	8	7	3.7E-03	4.2E-03	No	I	I
AP-5588	S	35	35	2.1E-03	2.2E-03	No	D	D
AP-5589	S	36	36	3.5E-03	3.5E-03	No	D	D
AP-6530	T	11	11	3.2E-03	3.0E-03	No	PD	S
AP-6532	T	37	37	6.4E-03	8.1E-03	No	I	I
AP-6535	T	9	9	3.2E-03	3.3E-03	No	S	S
AP-8061	T	28	28	4.6E-03	4.8E-03	No	S	D
AP-8063	T	27	26	2.6E-03	2.7E-03	No	D	D
FWLF-4	S	34	33	1.3E-03	1.3E-03	No	D	D
cis-1,2-DICHLOROETHYLENE								
AP-5588	S	35	34	1.5E-01	1.6E-01	No	D	S
AP-6535	T	9	9	3.2E-02	3.3E-02	No	NT	NT
AP-8061	T	28	28	1.7E-02	1.7E-02	No	D	D
AP-8063	T	27	27	7.6E-02	8.3E-02	No	I	NT
TRICHLOROETHYLENE (TCE)								
AP-5588	S	35	35	2.4E-01	2.5E-01	No	S	PD
AP-5589	S	36	36	4.0E-03	3.9E-03	No	I	I
AP-8061	T	28	28	8.2E-03	7.8E-03	No	D	D
AP-8063	T	27	27	2.0E-02	2.2E-02	No	PI	S

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Statistical Trend Analysis Summary

Project: OU4 2016

User Name: FES

Location: Fort Wainwright

State: Alaska

Time Period: 7/1/1997 **to** 10/1/2016

Consolidation Period: No Time Consolidation

Consolidation Type: Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
VINYL CHLORIDE								
AP-5588	S	35	29	9.9E-04	1.1E-03	No	S	NT
AP-5589	S	36	31	1.2E-03	1.2E-03	No	D	NT
AP-8063	T	27	23	1.2E-03	1.3E-03	No	D	S

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

APPENDIX E

PHOTO LOG

OPERABLE UNIT 4
PHOTOGRAPH LOG

No.	Date	Image #	Location	Direction	Description of Photograph
1	7/11/2016	IMG_4477	OU4	NE	Sampling well setup AP-10257MW with active landfill in BG
2	7/11/2016	IMG_4478	OU4	NE	Sampling setup on well AP-10258MW with active landfill in BG
3	7/11/2016	IMG_4479	OU4	Closeup	Logging groundwater parameters at AP-10258MW
4	7/11/2016	IMG_4480	OU4	Closeup	Grass nest in welded box on FWLF-4
5	7/11/2016	IMG_4481	OU4	Closeup	Grass nest in welded box on FWLF-4
6	7/12/2016	IMG_4482	OU4	E	Sampling setup on AP-6530. Note wet conditions
7	7/12/2016	IMG_4483	OU4	NE	Sampling setup on AP-6530
8	7/12/2016	IMG_4484	OU4	SW	Sampling setup on AP-6535
9	7/12/2016	IMG_4485	OU4	NE	Sampling setup on AP-6535
10	7/12/2016	IMG_4486	OU4	NE	CB logging groundwater parameters at landfill well
11	7/12/2016	IMG_4487	OU4	NE	CB logging groundwater parameters at landfill well
12	7/12/2016	IMG_4488	OU4	S	Sampling setup on well AP-8063
13	7/12/2016	IMG_4489	OU4	S	Sampling setup on well AP-8063
14	7/12/2016	IMG_4490	OU4	S	UTV was used to mobilize field crew and supplies to OU4 wells
15	7/12/2016	IMG_4491	OU4	N	UTV was used to mobilize field crew and supplies to OU4 wells

2016 GROUNDWATER SAMPLING LOG – OU4

Landfill groundwater sampling at AP-10258 (view to the Northeast)

Logging Groundwater Parameters at AP-10258 (view NA)

Sampling Setup on AP-6530 (view to the East).

Collecting groundwater parameters (view to the Northeast)

APPENDIX F

FFA MEETING KEY DECISION ITEMS

Discussion Items / Key Decisions

Winter 2016 Fort Wainwright Federal Facilities Agreement Meeting

Westmark Hotel, Fairbanks, AK
February 9 through 11, 2016

ATTENDEES (three days of meeting attended, unless otherwise noted)

Alaska Dept. of Environmental Conservation (ADEC)	Kim DeRuyter, Eric Breitenberger, Dennis Shepard, Josh Barsis (by telephone; Feb 9th am only), Monte Garroutte (Feb 9th pm only), Guy Warren (Feb 11th only)
U.S. Environmental Protection Agency (USEPA)	Sandy Halstead (Feb. 10th and 11th only) Jan Palumbo, Harry Craig (both by telephone; Feb 11th am only)
Alaska Department of Natural Resources (ADNR)	Mandy Willingham (Feb 11th am only)
Headquarters, Department of the Army Office of the Assistant Chief of Staff for Installation Management	Bryan Frey
Army Environmental Command (AEC)	David Mays, Cheryl Churchman Mark Ditmore (by telephone; Feb 11th only)
Army Directorate of Public Works-Environmental (DPW)	Joe Malen, Brian Adams
U.S. Army Garrison Alaska – Range Control	Gregory Swallows (Feb. 11th am only)
U.S. Army Corps of Engineers (USACE)	Bob Hazlett, Teresa Lee
Cold Regions Research Engineering Laboratory (CRREL)	Anna Wagner, Gary Larson (both Feb. 11th am only)
Fairbanks Environmental Services (FES)	Craig Martin, Aaron Swank, Karol Johnson, Bryan Johnson, Vanessa Ritchie (all Feb. 9th and 10th only)
Marsh Creek Environmental	Patricia Curl, Forrest Janukajtis (both Feb. 11th am only)

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 Decisions	Responsible Party	Follow-up Actions
Tuesday, February 9th			
2-Party Program Review: Excavation and Treatment of Contaminated Soil	For 2-Party Sites, ADEC needs to be able to track excavated soils from "cradle to grave": • If soil is moved from a spill site to the Chip Yard, ADEC needs to be informed of that move via a transport form • The same transport form that is currently being used to send the soil to OIT can be used; however if there are no laboratory results the PID readings can be used instead • When the soil is moved from the Chip Yard to OIT, it would need a separate transport form, which would include laboratory results • ADEC would also need a copy of the documentation once the soil has been treated and returned • IDW moving within Ft Wainwright would not need a transport form	Army / ADEC	Army will begin stating the storage location of contaminated soil on the spill report ADEC will ask Spill Response to capture FTW Spill Number in their system Army requests ADEC provide citation for requirement regarding movement of contaminated soil within Installation boundary The Army requests a meeting with ADEC to further discuss these procedures
2-Party Program Review: Site Identification / Designation	• DPW assigns a Spill ID to each spill/contaminated site, in numeric order by year; this number is unique for each spill/release event • New spill/contaminated sites would be reported to ADEC PERP and would get an ADEC Spill ID • If a site can be cleaned up and closed through PERP, that would be much quicker and easier than if it goes to the Contaminated Sites program • If it turns out to be an historical spill, it would go to the Contaminated Sites program • The site would only get a Hazard ID if it moves to the Contaminated Sites program	Army / ADEC	Army and ADEC will build a data base / cross-walk for all the 2-Party and 3-Party sites that shows the Army's database number, the ADEC file number, and the ADEC Hazard ID
FTW Policy Issues	• FTW indicated a new Garrison Policy is being prepared for LUC / ICs • There are many monitoring wells remaining on FTW that are no longer being used that need to be decommissioned	Army	Army will provide the new LUC/IC Policy when it is issued Army will supply a Work Plan with justification prior to decommissioning any wells, and a follow-up report

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
Neely Road (2-Party Site)	• A site update was provide, including clarification that “Neely Road” refers to the Former Bldg 3750 gas station, which preceded the Bldg 3562 PX gas station where UST removal is planned • Elevated contaminant levels in 2014 are thought to have been related to high groundwater levels that year; presentation of 2015 preliminary data indicate COC concentrations have decreased	Army	2015 Monitoring Report will be provided when available
Other 2-Party Sites	As at Neely Road, elevated contaminant levels in 2014 are thought to have been related to high groundwater levels that year; presentation of 2015 preliminary data indicate COC concentrations have decreased	Army	2015 Monitoring Report will be provided when available
Seward Rec Camp (2-Party Site)	IC inspections of the remaining wells are conducted annually; since this is an external site, during years when monitoring is not conducted the Army suggested these inspections could be done by on-site personnel; ADEC indicated tentative acceptance of this suggestion	Army	This recommendation will be included in the 2015 Monitoring Report
Bldg 3562 PX Gas Station UST Removal (2-Party Site)	• ADEC understands the Consent Order has a very tight schedule, therefore close communication is key in case there is an issue with the time-line • ADEC will expedite document review as much as possible • ADEC would like to be present when the tanks are removed from the ground	Army	The Army will provide proper notification to ADEC of the date of tank removals
Tok Fuel Terminal – NW Landfill (CERCLA Non-NPL Site)	• Geophysical surveys showed several areas that may need further delineation, including the former “Ski Hill” area, and the southwest corner • Test pit excavations showed primarily household waste and debris • The most significant contamination identified was DRO below the water table in a soil boring in the southwest corner of the landfill; additional investigation may be needed to identify the source of this contamination	Army	Complete results will be presented in the upcoming SI report

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
Tok Fuel Terminal – Remedial Investigation (State Petroleum and CERCLA Non-NPL)	• Shallow PCE contamination was observed throughout the Main Terminal Area soils; POL contamination was identified in saturated soils 5-10 feet below the water table; PCE exceeded cleanup levels in only one well, and DRO in two wells • POL exceeding ADEC cleanup levels were identified in soils and groundwater associated with several former bulk ASTs; lead contamination, presumably associated with lead paint, was also identified at several ASTs • DRO, GRO, PCE, and TCE were identified in test pit soil samples from the SE landfill • There is a discrepancy regarding the exact property boundary location on the east side of the compound which may affect investigation of the SE Landfill	Army	These issues will be discussed in the upcoming RI report which will be submitted in fall 2016 The Army is continuing research to determine the legal property boundary
General	• ADEC asked if it would be possible for the Army to have a facilitator involved to ensure that meeting agendas and invitations are sent out in a timely manner • ADEC requested that invitations be sent to Outlook to get it on the calendar; they would also like to see meeting minutes submitted in a timely manner	Army	The Army is investigating whether funding is available for this
Wednesday, February 10th			
Operable Unit 1	• Detection limits for dieldrin were discussed; the lab was supposed to use a low level method but did not do so, and due to interferences from other analytes, detection limits in some well samples were above cleanup levels • ADEC asked about sediment sampling along the Chena River; sediment samples were taken as part of the RI	Army	This issue will be fully discussed in the laboratory data packet of the 2015 Monitoring Report, which will be provided when available

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
Operable Unit 2 – DRMO Yard and Former Bldg 1168	• ADEC asked about cost effectiveness of doing the chemical injection at the DRMO; that it was done prior to the treatability study and showed that injection would be more cost effective than long-term monitoring • ADEC asked for a copy of the cost analysis Technical Memorandum	Army	DRMO Treatability Study Cost Analysis TM will be provided to ADEC
	• EPA expressed support for moving the Bldg 1168 site from the 3- to 2-Party program – EPA suggested doing the transfer via an IRACR; it would be "interim" because the OU would not be closing, just that piece of the OU would be moved; once the rest of the sites in the OU close, they would be closed with a RACR?	Army	The Army will provide a recommendation in the upcoming Five-Year Review
	– EPA can provide information from sites at JBER that are doing this	EPA	EPA will provide information from sites at JBER
Operable Unit 3 – Birch Hill Tank Farm	• Regarding the EDB plume on the east side of Birch Hill, ADEC asked if it might be related to pipelines, and whether or not sampling for EDB would be done in association with pipeline removal; Army indicated that the contamination is believed to have migrated from a different tank than the DCA (which migrates south and west of Birch Hill), but sampling associated with pipeline removal would include EDB in this area since it is a COC • In general, sampling for the pipeline removal project would take into consideration the areas where removal is occurring (i.e., if pipeline is removed from an OU, sampling would incorporate COCs from that OU) • EPA asked about potential spread of contaminated soil during AST removal since work was supposed to have been done with snow on the ground; although there was snow when the Tank Farm work began, there was no snow by the time work at the last tank (Tank 316) was completed; Army indicated that all equipment was decontaminated when moving from tank basins to keep potentially contaminated soil from spreading • ADEC expressed concerns regarding the current understanding of the nature of the fractured bedrock on Birch Hill; the Army indicated it has been studied extensively, and the results are presented in the 2007 Birch Hill Summary Report	Army	Army will recommend in the upcoming Five-Year Review to conduct a data-gap analysis at the OU3 Birch Hill Tank Farm A copy of the 2007 Birch Hill Summary Report will be provided to ADEC

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
Operable Unit 3 – Railcar Off-Loading Facility	• Benzene levels in the Valve Pit B area increased last year, and EPA asked why; Army answered that high water levels are thought to have re-introduced contaminants from the smear zone, but this appears to be a short-lived anomaly • ADEC asked about TAH/TAqH exceedances near Valve Pit A, whether the Army can install additional downgradient wells; Army indicated that Alaska RR tracks are located downgradient and it is extremely difficult to get permission to work within their right-of-way	Army	These issues will be discussed in the 2015 Monitoring Report, which will be provided when available
Operable Unit 3 – Fairbanks-Eielson Pipeline Milepost Sites	Army suggested this site (and possibly all OU3 sites) could be moved to the 2-Party program since all contamination is petroleum related	Army	Army will make this recommendation in the upcoming Five-Year Review
Operable Unit 6	Second year of vapor intrusion sampling began in February 2016; the first round of groundwater monitoring will be conducted in spring 2016	Army	Results will be provided in 2016 Monitoring Reports when available
Operable Unit 4 – FTW Landfill	EPA mentioned that 1,4-Dioxane is an emerging contaminant of concern that may be associated with TCA; since TCA is found at the Landfill, the Army may need to add it to the analytical suite	Army / EPA	This issue will be addressed as part of the Five-Year Review
Operable Unit 4 – Fire Training Pits	• ADEC mentioned that typically perfluorinated compound (PFC) concentrations are higher in subsurface soils and lower in surface soils, but concentrations at the FTP are the opposite, higher in the surface soils • PFC concentrations in groundwater are generally low but exceed the EPA Health Advisory Levels	Army	These issues will be addressed in the 2015 Monitoring Report, which will be submitted when available
Operable Unit 5	• ADEC asked for a copy of the 1999 Chena River Aquatic Assessment Report (CRAAP) • Decommissioning of the Sparge Curtain treatment system is scheduled for spring 2016	Army	Army will provide a copy of the CRAAP to ADEC

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
Basewide LUC's / IC's	• ADEC asked about language on Dig Permit: Needs to say that no soil will be moved from a "site" without ADEC approval (currently says "installation"); Army discussed this issue during the meeting and said the instructions on the dig permit specified soils could not be moved without Army approval • ADEC suggested that final reports include a copy of the ADEC WP approval letter • ADEC asked about how corrective actions are tracked; Army indicated the Annual IC Report has a section that discusses any IC issues and what corrective action was taken • All known monitoring wells on Base were inspected; recommend decommissioning of all wells that are no longer being used	Army	The Army requests a meeting with ADEC for further discussion Army concurs Army will propose a Base-wide monitoring well decommissioning plan based on information in the Annual IC Report
FTW RAB Solicitation	Mailers were distributed to everyone that lives on Ft Wainwright; both ADEC and EPA indicated approval of the mailer	Army	All responses to the mailers will be collected and tabulated to determine if a RAB will be formed
Fourth Five-Year Review	• Interview questionnaire forms will be sent out shortly	Army	Interview Questionnaire Forms were sent on 10 February 2016
	• Army indicated the pre-draft Review will require substantial revision and a draft will be submitted no earlier than April/May timeframe	Army	Draft Five-Year Review will be submitted for review no earlier than April/ May
	• EPA asked about the use of 2015 data which has not yet been approved by the RPMs; Army indicated that reports are in process, in fact Draft reports for OU2 and OU5 have already been submitted; reports for other sites (OU1, OU3, OU4) will be expedited	Army	Submittal of Annual Monitoring Reports for OU3, and OU4 will be expedited
	• EPA indicated the OU1 report in particular should be expedited because it is on a 5-year cycle	Army	The OU1 report will be submitted by the end of February
	• EPA indicated there is a new stream-lined Five-Year Review template in process, but it is not yet available	EPA	EPA will provide a copy of the stream-lined Five-Year Review template when it is available

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
General	• FES will be submitting WP for base-wide monitoring work in 2016 and 2017; EPA asked if it could just be done as an amendment of the existing UFP-QAPP; since there are numerous changes a new QAPP is needed, but FES will provide a table up front showing what has changed since last time, which should expedite the review process • Discussion about using the FES QAPP for other contracts if they (FES) are a sub-contractor; this would be acceptable to ADEC and EPA; any significant changes would be described in a site-specific work plan which references the QAPP	None	None
Thursday, February 11th			
"SIRI" – PSE and Data-Gap Analysis Sites	EPA said the PSE document should have clear recommendations as to the disposition of the sites (i.e., NFA, CERCLA NFA [move to 2-Party Program], further action needed, etc.)	Army	PSE document will contain clear recommendations for each site
Bombing Range	• Contract would go through the Baltimore District since they are one of the MMRP centers of expertise; scope is in process but intention would be to get contract awarded in time to do sampling this year • Field assessment would look at the surface water (lakes and streams) • Army plans to provide a copy of the scope to ADEC for review, which will be discussed prior to going out for bid	Army	Scope will be provided for review, and discussed with ADEC prior to going out for bid
	• ADNR asked about site ICs – Army said the problem with ICs is that the Army does not own the property, so ICs would be in the form of education and getting the information out to inform the public – Army, ADNR, and ADEC have requested Fish & Game include information in the hunting regulations, but to date F&G has been unable to do so; Army has requested ADNR assistance with this issue – ADNR is coordinating with F&G to make this a Tag Area, which would provide the Army's safety information	Army / ADNR / ADEC	Army, ADNR, and ADEC will continue to work with F&G to see if information can be added to hunting regulations, and will research making this a Tag Area

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
Tanana River OB/OD Site – Geophysical Investigations	ADEC asked about how much of the site has been surveyed so far and how much will be done in the spring: – CRREL provided diagrams showing what has been done at the site to this point – Army said the intent is to have the remainder of the site surveyed in the spring, and any additional anomalies that are found will be removed	Army / CRREL	Previous survey reports have already been provided, future work will be incorporated into the TCRA fter-Action Report
Tanana River OB/OD Site – General Discussion	• EPA asked how the Army is determining the boundary of the OB/OD site, what documentation or field results are used to show the OB/OD area has been cleared – Army indicated the area was excavated until all buried debris had been removed and native soil was encountered; there may still be surface debris, but that would be from normal range usage – EPA asked if the items removed have been UXO or all DMM – ADEC indicated that since this is an active range, getting a completely clean boundary is unlikely, but the intent should be to remove buried debris and not surface debris • Army indicated they plan to complete work at the site this year in order to minimize disruption to Range operations • EPA indicated if something is found in the soil, groundwater sampling would be needed – The sampling plan will be discussed at a future meeting with EPA and ADEC – EPA wants to be sure that things are done to satisfy RCRA, although it may not necessarily be a RCRA site • EPA asked if it would be possible to have video cameras installed at the site; Range Operations indicated they have tried cameras and found they provided no useful information	Army Army	Site boundary was determined in the Action Memorandum dated 21 August 2015, which incorporated the initial CRREL geophysical report DMM and munitions debris were found, but no UXO was discovered during the fall 2015 removal activities

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
Tanana River OB/OD Site – Regulatory Authority	Army requested EPA provide something in writing stating how they want this site to proceed: CERCLA or RCRA – ADEC said they would prefer the investigations continue under the TCRA, as a CERCLA site; ADEC's concern is that if it falls under RCRA, they will not be part of the process; EPA indicated that ADEC could be involved under RCRA, but ADEC indicated that funding would be an issue under that scenario – Army is concerned that if it is forced under RCRA, all currently planned sampling will need to be re-assessed – EPA is concerned that as a TCRA, the Army could proceed without EPA input; although this process has been done with RPM cooperation so far, it's been kind of a hybrid process	EPA Army	EPA will provide a written statement to the Army that clearly states under what authority they plan to regulate the site Army will continue to solicit input from EPA and ADEC; if EPA accepts including this site under CERCLA and the FFA, a site schedule will be developed and the FFA process will be followed
New Sites	• The Army wants to continue dealing with new sites under CERCLA (as specified in the FFA) – EPA would like to continue under the FFA (EPA stated the RCRA program is not seeking to take on more sites) but they are concerned the Army has not followed the process in the past (i.e., the OB/OD site) – ADEC would like to follow the FFA, but would like to better define what the process is (timeline, requirements, etc); they indicated the Eielson FFA has a much more detailed PSE process; ADEC can provide a flow-chart that is used at Eielson – ADEC is concerned that the FTW FFA does not define the PSE process: there is no timeline, and it does not describe what the PSE would entail, or if the PSE is a primary or secondary document; EPA agrees with this concern – FFA Attachment I describes the PSE process and which of the three paths come out of that – ADEC does not necessarily think a formal change to the FFA is needed, as long as the team is meeting on a monthly basis, and new sites are being regularly reported; these changes can be made more informally at a lower level • ADEC stated their legal counsel believes the FFA trumps the RCRA Permit, therefore any new sites would first go to the FFA	Army ADEC	Army will work with EPA and ADEC to address these concerns in accordance with the FFA ADEC to provide a sample flow-chart for discussion of the PSE process

Site / Topic	Discussion Items / Key Decisions	Responsible Party	Follow-up Actions
New Sites (continued)	• Example Site: Doyon Drum Site – Notification was made under CERCLA and RCRA, but there is still uncertainty about which way it will go – ADEC thinks notification requirements should depend on the contaminants that are found – ADEC expressed their preference that the process continue as outlined in the FFA because defaulting to RCRA would essentially cut ADEC out of the process		
	• ADEC is concerned they do not have After-Action Reports (AARs) for all the sites in their database	Army	Army will work with ADEC to resolve this concern and will provide copies of any missing documents
	• EPA is concerned about the acceptability of some WPs from construction contractors	Army	Army would like to discuss this further
	• All new sites are reported to the ADEC Spill program, with cc to Contaminated Sites and EPA	Army	All new sites will be added to the Quarterly Update Report
	• New sites will be reported to the EPA RPM who will determine if RCRA needs to be involved		
	• ADEC suggested a document be drafted that shows what process will be used to document new sites as per the FFA, the RPMs can approve by signing	Army	Army will provide a draft document

COMMENTS

REVIEW COMMENTS

PROJECT: Fort Wainwright

DOCUMENT: Draft 2016 Annual Sampling Report, OU-4 Landfill

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 06/28/2017** **REVIEWER: Dennis Shepard** **PHONE: 907-451-2180**	**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**	**ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**	**CONTRACTOR RESPONSE**
1	General	ADEC revised articles 3 and 9 of 18 AAC 75 on November 6, 2016. The revisions included changes to the Method Two Soil and Groundwater cleanup levels. The latest version of 18 AAC 75 includes all revisions and amendments through July 1, 2017. Please revise References section to cite the July 1, 2017 update.	A	The references section will be revised to cite the July 1, 2017 update.		
2	General Figures	Please also indicate on the appropriate figures, the location of the containment cell containing pesticide-contaminated soil from OU-1. This pesticide containment cell should be noted on figures for all future documents. DEC has identified this feature as needing better documentation for future Project Management and should be included in all future documents for the OU-4 Landfill site.	A	The appropriate figures will indicate the location of the containment cell containing pesticide-contaminated soil from OU-1. This pesticide containment cell will also be noted on figures for all future documents.		
3	Pg. i	Text states: Downgradient of the Landfill, COCs were detected above RAGs in five out of seven wells: shallow wells AP-5588 and AP-8061, “AP-8061 – benzene and TCE” However, according to the Laboratory results for 16FWOU405WG and the Table C-2, the well did not exceed RAGs for benzene or TCE. Please clarify. Revise text as necessary.	A	The text was revised and the bullet was removed from the executive summary. This is not stated anywhere else in the report.		
4	Pg. 1-5	According to the DEC Solid Waste Program, requirements of 40 CFR 258 and the MOU objectives are not being adequately met. All analytes in Appendix II to Part 258 need to be included in the sampling program. Groundwater monitoring at Landfills must be monitored for	N	The Fort Wainwright Solid Waste Program is in the process of setting up an independent groundwater monitoring program to meet compliance requirements as part of a new permit agreement with ADEC Solid Waste. Groundwater		

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 06/28/2017** **REVIEWER: Dennis Shepard** **PHONE: 907-451-2180**	**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**	**ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**	**CONTRACTOR RESPONSE**
		at least 30 years after closure. In addition, groundwater monitoring at landfills does not allow for removal of wells. Even if COC's are below cleanup levels and meet the requirements of the CS program, the monitoring wells must continue to be monitored until all requirements for the Solid Waste Program have been met.		monitoring completed under the FFA agreement will meet CERCLA requirements, but will not include ADEC Solid Waste requirements as the Army views these as two different programs. However, a courtesy report will continue to be sent to ADEC Solid Waste in addition to any reports developed under the Fort Wainwright Compliance program.		
5	Figure 3-3	@AP-5589. The TCE exceedance (Oct. 16) is not highlighted Blue. Please revise.	A	The TCE exceedance (Oct. 16) for AP-5589 will be highlighted blue.		
6	Pg. 1-6, Table 1-1	Has DH-6534 been renamed to AP-6532? If this well will be referenced as AP-6532, then it should be renamed.	A	There has been some confusion in the past regarding wells DH-6534 and AP-6532. The report states that well AP-6532 was historically identified as DH-6534. However, when the total depth on the boring log for DH-6534 was compared to the total depth of the well being sampled, there was a discrepancy. 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 that was being sampled, identified as DH-6534, is actually AP-6532. The total depth of AP-6532 also matches the total depth listed on the boring log. This research also verified that the well identified as Unknown F is actually DH-6534. These wells have been correctly labeled in the field and do not need to be renamed.		

REVIEW COMMENTS

PROJECT: **Fort Wainwright**

DOCUMENT: **Draft 2016 Annual Sampling Report, OU-4 Landfill**

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 06/28/2017** **REVIEWER: Dennis Shepard** **PHONE: 907-451-2180**	**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**	**ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**	**CONTRACTOR RESPONSE**
7	Pg. 1-7	Text 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." Please add that the well was removed in 2011. Is there a current designated background well in the OU-4 monitoring well network? Please add a discussion of current background sampling or plans for installation of a background well.	A	The text will be revised to state that AP-6132 was removed as a background well in 2011. FWLF-4 became the designated background well after it was determined that shallow groundwater flow at AP-6132 was not connected to groundwater flow beneath the Landfill due to a massive permafrost block between the well and the Landfill.		
8	Pg. 4-1	Text Statement: "…over 100 wells associated with the Landfill, but no longer sampled, were located and inspected." Are any of these 100 wells still in decent condition for sampling?	A	Yes - some of the inactive wells may be suitable for sampling. However, since many of the wells were installed into permafrost, further evaluation would be necessary to determine if the wells are viable for sampling. Any inactive well located downgradient of the landfill that appeared to be in good condition was recommended to be retained for possible future sampling, as discussed in the 2017 Monitoring Well Decommissioning Work Plan. Wells that were identified as damaged or severely frost-jacked during the IC inspection, or inactive wells upgradient of the landfill, were recommended for decommissioning in the 2017 Well Decommissioning Work Plan.		
9		--End of Comments--				

REVIEW COMMENTS

PROJECT: OU4 (FTW-038) 2016 Annual Monitoring

DOCUMENT: Preliminary Draft 2016 Annual Sampling Report

Location: Fort Wainwright, AK

U.S. Environmental Protection Agency	**DATE: 10/20/17** **REVIEWER: Sandra Halstead** **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)	ARMY RESPONSE	USACE/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	page ii	Typo - Last paragraph with recommendations should be 7 wells sampled in spring and fall 2017, not 2016	A	The typo will be corrected	
2.	Page 5-3, Well AP-6535 and Table 5-1	Narrative suggests moving to spring only sampling, Table shows spring and fall. Unsure why only one of the deep wells would be recommended reduced to spring only sampling if the other 3 deep wells are going to remain on a biannual sample frequency. Please resolve the discrepancy. Also the recommendation is for 2018 to move to spring only. I guess we'll see if that is what's in the 2018 workplan addendum.	A	AP-6535 was sampled in the spring and fall 2017. The Report will be corrected to reflect this. The 2018 sampling will be evaluated in the 2017 Monitoring Report.	
3.	Table 2-2	AP-6532 and AP-8063 deep wells can show some fairly big swings in aquifer biogeo conditions (DO, ORP) from spring to fall but that doesn't seem to impact COC concentrations	Noted		
4.	Sec 3.2 and Graphs (Figures) 3-4 to 3-10	Elevation and concentration appear to be inversely correlated - when groundwater elevations are high, COC concentrations are lower. Suggests dilution is occurring, not DNAPL desorption. There is a big shift in groundwater elevations in the 1999-2000 timeperiod. I assume this is due to a change in contractors and the method to measure groundwater elevation, not a seismic shift in actual groundwater hydrology.	Noted Noted		
5.		Might be worth sampling AP-6534 (deep, SW of the chlorinated solvent wells AP-5588, AP-8063) to try to get a boundary on that plume. Maybe at least prior to the next Five Year Review.	Noted	This can be evaluated in the 2017 Monitoring Report.	
6.		When the Army conducts the PFAS PA, the landfill should be included as a potential source area since the excavated soils from the Fire Training Pits were treated at OIT and then disposed of at the landfill.	Noted		

COVER LETTERS

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
DIRECTORATE OF PUBLIC WORKS
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

November 3, 2017

Directorate of Public Works

Subject: Submission of the Final 2016 Operable Unit 4 Annual Sampling Report for the U.S. Army Garrison Fort Wainwright, Alaska (USAG FWA) to the Environmental Protection Agency.

Dr. Laura Buelow
Environmental Protection Agency
Project Manager
Hanford Project Office
825 Jadwin Ave., Ste 210
Richland, WA 99352

Dear Dr. Buelow:

Enclosed with this letter is the Final 2016 Operable Unit 4 Annual Sampling Report, Fort Wainwright, Alaska. The report is provided as an electronic copy via AMRDEC.

A copy of this letter and report are being provided to the Mr. Dennis Shepard, Environmental Program Manager, Alaska Department of Environmental Conservation, Ms. Sandra Halstead, Federal Facilities Superfund Site Manager Project Manager, Environmental Protection Agency, and Erica Blake, Environmental Program Specialist, 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 Ms. Kristina Smith, Directorate of Public Works, Remedial Project Manager at (907) 361-9687 or email: kristina.a.smith14.civ@mail.mil.

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Brian M. Adams
Restoration Program Manager

CF:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
DIRECTORATE OF PUBLIC WORKS
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

November 3, 2017

Directorate of Public Works

Subject: Submission of the Final 2016 Operable Unit 4 Annual Sampling Report for the U.S. Army Garrison Fort Wainwright, Alaska (USAG FWA) to the 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 2016 Operable Unit 4 Annual Sampling Report for Fort Wainwright, Alaska. The report is provided as an electronic copy via AMRDEC.

A copy of this letter and report are being provided to the Mr. Dennis Shepard, Environmental Program Manager, Alaska Department of Environmental Conservation, Dr. Laura Buelow, Project Manager, Environmental Protection Agency, and Erica Blake, Environmental Program Specialist, 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 Ms. Kristina Smith, Directorate of Public Works, Remedial Project Manager at (907) 361-9687 or email: kristina.a.smith14.civ@mail.mil.

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Brian M. Adams
Restoration Program Manager

CF:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
DIRECTORATE OF PUBLIC WORKS
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO ATTENTION OF:

November 3, 2017

Directorate of Public Works

Subject: Submission of the Final 2016 Operable Unit 4 Annual Sampling Report for the U.S. Army Garrison Fort Wainwright, Alaska (USAG FWA) to the State of Alaska Department Environmental Conservation.

Ms. Erica Blake
Alaska Department of Environmental Conservation
610 University Ave
Fairbanks, AK 99709-3643

Dear Ms. Blake:

Enclosed with this letter is the Final 2016 Operable Unit 4 Annual Sampling Report for Fort Wainwright, Alaska. The report is provided as an electronic copy via AMRDEC and on DVD.

A copy of this letter and report are also being provided to Ms. Sandra Halstead, Federal Facilities Superfund Site Manager, Environmental Protection Agency, Dr. Laura Buelow, Project Manager, Environmental Protection Agency, and 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 Ms. Kristina Smith, Directorate of Public Works, Remedial Project Manager at (907) 361-9687 or email: kristina.a.smith14.civ@mail.mil.

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Brian M. Adams
Restoration Program Manager

CF:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
DIRECTORATE OF PUBLIC WORKS
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

November 3, 2017

Directorate of Public Works

Subject: Submission of the Final 2016 Operable Unit 4 Annual Sampling Report for the U.S. Army Garrison Fort Wainwright, Alaska (USAG FWA) to the State of Alaska Department Environmental Conservation.

Mr. Shepard
Alaska Department of Environmental Conservation
610 University Ave
Fairbanks, AK 99709-3643

Dear Mr. Shepard:

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A copy of this letter and report are also being provided to Ms. Sandra Halstead, Federal Facilities Superfund Site Manager, Environmental Protection Agency, Dr. Laura Buelow, Project Manager, Environmental Protection Agency, and Erica Blake, Environmental Program Specialist, Alaska Department of Environmental Conservation.

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Brian M. Adams
Restoration Program Manager

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