Final
2019 Groundwater Monitoring Report

Operable Unit 6

HQAES No. 02871.1088
ADEC Hazard ID. 4140, File No. 108.38.085

Contract No. W911KB-16-D-0005

Task Order W911KB18F0053

April 2020

DRAFT 2019 ANNUAL GROUNDWATER MONITORING REPORT

OPERABLE UNIT 6
FORMER COMMUNICATIONS SITE

For:

U.S. Army Garrison Alaska

March 2020

Prepared under contract to

U.S. Army Corps of Engineers, Alaska District

Post Office Box 6898
JBER, Alaska 99506-6898
Contract W911KB-16-D-0005, Task Order W911KB18F0053

Prepared by

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FES Project No. 9011-21

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON ALASKA
1046 MARKS ROAD #6000
FORT WAINWRIGHT, ALASKA 99703-6000

April 28, 2020

Directorate of Public Works

Subject: Submission of the Final 2019 Monitoring Report, Operable Unit 6, to State of Alaska Department Environmental Conservation.

Ms. Sara Marshall
Environmental Program Specialist
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709

Dear Ms. Sara Marshall:

This letter documents transmission of the Final 2019 Monitoring Report, Operable Unit 6, on Fort Wainwright to State of Alaska Department Environmental Conservation.

A digital copy of the document will be provided to you and two CD's will be delivered to ADEC in Fairbanks. A copy of the letter is being provided to Ms. Erica Blake, Environmental Program Specialist, Alaska Department of Environmental Conservation and Ms. Sandra Halstead, Federal Facilities Superfund Site Manager, Environmental Protection Agency. If you would like to receive a hard copy of this document, please notify us within the next few weeks.

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, Ms. Bri Clark, Alternate Remedial Program Manager (907) 361-3001 or email brianne.r.clark.civ@mail.mil or you may contact Mr. Seth Reedy, Alternate Remedial Program Manager (907) 361-6489 or email seth.a.reedy.civ@mail.mil.

Sincerely;

Brian Adams
Remedial Project Manager

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

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON ALASKA
1046 MARKS ROAD #6000
FORT WAINWRIGHT, ALASKA 99703-6000

April 28, 2020

Directorate of Public Works

Subject: Submission of the Final 2019 Monitoring Report, Operable Unit 6, to State of Alaska Department Environmental Conservation.

Ms. Erica Blake
Environmental Program Specialist
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709

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Sincerely;

Brian Adams
Remedial Project Manager

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DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON ALASKA
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

April 28, 2020

Directorate of Public Works

Subject: Submission of the Final 2019 Monitoring Report, Operable Unit 6, to Environmental Protection Agency.

Ms. Sandra Halstead
Environmental Protection Agency
Federal Facilities Superfund Site Manager
Alaska Operations Office
222 W. 7th Ave, #19
Anchorage, AK 99513

Dear Ms. Halstead:

This letter documents transmission of the Final 2019 Monitoring Report, Operable Unit 6, on Fort Wainwright to the Environmental Protection Agency.

A digital copy of the document will be provided to you. A copy of this letter is being provided to Ms. Erica Blake, Environmental Protection Specialist, and Mr. Sara Marshall, Environmental Program Specialist, Alaska Department of Environmental Conservation. If you would like to receive a hard copy of this document, please notify us within the next few weeks.

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, Ms. Bri Clark, Alternate Remedial Program Manager (907) 361-3001 or email brianne.r.clark.civ@mail.mil or you may contact Mr. Seth Reedy, Alternate Remedial Program Manager (907) 361-6489 or email seth.a.reedy.civ@mail.mil.

Sincerely;

Brian Adams
Remedial Project Manager

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFCEE	Air Force Center for Engineering and the Environment
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
bgs	below ground surface
CDQR	Chemical Data Quality Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Cost Effective Sampling
COC	contaminant of concern
CUL	cleanup level
CY	cubic yards
DCE	dichloroethene
DERA	Defense Environmental Restoration Account
DO	dissolved oxygen
DoD	Department of Defense
DRO	diesel range organics
ECC	Environmental Compliance Consultants
EPA	Environmental Protection Agency
FES	Fairbanks Environmental Services Inc.
FCS	Former Communication Site
FFA	Federal Facility Agreement
GAC	granular activated carbon
GIS	geographic information system
HQAES	Headquarters Army Environmental System
IC	Institutional Control
ICIAP	Institutional Controls Implementation Action Plan
IDW	investigation-derived waste
LOD	limit of detection
MAROS	Monitoring and Remediation Optimization System
MCL	Maximum Contaminant Level
MNA	monitored natural attenuation
mV	millivolts
mg/L	milligrams per liter
µg/L	micrograms per liter
NAPL	non-aqueous phase liquids
ND	not detected
ORP	oxidation/reduction potential
OU6	Operable Unit 6
PCBs	polychlorinated biphenyls
PSEs	Preliminary Source Evaluations
PCL	project cleanup level
POL	petroleum, oil, and lubricants
QC	quality control
QSM	Quality Systems Manual

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

RAO	Remedial Action Objective
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RRO	residual range organics
SVOC	semivolatile organic compounds
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TCP	1,2,3-trichloropropane
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

EXECUTIVE SUMMARY

This report presents results of the groundwater monitoring conducted at the Operable Unit 6 (OU6) Former Communications Site (FCS) on Fort Wainwright, Alaska. The Record of Decision (ROD) selected remedy for OU6 consists of Institutional Controls (ICs) for soil and institutional controls with monitored natural attenuation (MNA) of contaminants of concern (COCs) in groundwater. Groundwater monitoring results were evaluated to determine the effectiveness of natural attenuation with respect to ROD project cleanup levels (PCLs), and to support decisions regarding the effectiveness of the ROD remedy.

The OU6 FCS groundwater monitoring program focuses on three areas of groundwater contamination; three adjacent diesel range organics (DRO) groundwater plumes, a 1,2,3-trichloropropane (TCP) plume, and a trichloroethene (TCE) plume. In addition, groundwater samples are collected from background wells and wells located near a water supply well. Several changes to the groundwater monitoring program were made in 2019 by approval of the Remedial Project Managers. Those changes, as identified in the 2019 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan (FES, 2019), included decreasing the sample frequency from semiannually to annually and reducing the number of natural attenuation parameters that were analyzed for. In addition, all monitoring wells were resurveyed to improve the accuracy of groundwater elevation measurements and determination of the groundwater flow direction.

Groundwater samples were collected from 25 wells during May 2019, and two wells were resampled in August 2019. Samples were submitted for analyses that varied depending upon the plume that was being monitored. Sample results were compared to ROD PCLs and Alaska Department of Environmental Conservation (ADEC) cleanup levels (CULs). Groundwater monitoring results between 2007 and 2019 were used to conduct a statistical evaluation of contaminant trends and plume stability.

DRO GROUNDWATER PLUME SUMMARY

Groundwater samples were submitted for analysis of DRO, residual range organics (RRO), and geochemical parameters from 13 wells associated with the DRO plumes. Four wells were sampled within the main DRO plume, two wells in adjacent DRO plumes, and seven wells located downgradient and crossgradient of the DRO plumes.

DRO exceed the PCL in three wells associated with the main plume and one well in an adjacent plume. RRO was below the PCL in all wells, however the limit of detection (LOD) exceeded the PCL in several samples. DRO concentrations were significantly higher in 2019 in several wells. The DRO concentration in MW33, which typically has the highest DRO concentration of the DRO plume wells, had a historical high concentration in 2019. MW77 had a thin layer of measurable non-aqueous phase liquid (NAPL) prior to the groundwater sample collection. Groundwater

elevations were significantly lower in the 2019 sampling than in previous years, and may have influenced the presence of NAPL and higher DRO concentrations.

An evaluation of the DRO contaminant trends shows that DRO concentrations at the extent of the main plume are stable; however, concentrations at the center of the plume are increasing. DRO and RRO concentrations in the interior of the plume are expected to persist above the PCL, due to residual NAPL remaining in the soils that continues to be solubilized in the groundwater. Higher concentrations of dissolved manganese and iron, lower concentrations of sulfate, and higher concentrations of methane are evidence that metal and sulfate reduction, as well as methanogenesis, are significant biodegradation processes in the main DRO plume source area. An estimation of the time to cleanup could not be determined for DRO or RRO in monitoring wells associated with the main DRO plume since there were no decreasing trends. When NAPL within the plume is depleted and no longer generates dissolved contaminant concentrations, decreasing trends should become apparent.

TCP GROUNDWATER PLUME SUMMARY

Groundwater samples were submitted for analysis of low level volatile organic compounds (VOCs) and geochemical parameters from four wells associated with the TCP plume and four downgradient sentry wells. Two wells, MW47 and MW79, consistently have TCP concentrations exceeding the PCL. Natural attenuation processes are expected to reduce concentrations in downgradient monitoring well MW47 to achieve cleanup attainment by 2038. In contrast, exceedances will likely continue at monitoring well MW79 until the suspected TCP soil source is depleted. For the two other TCP plume wells, TCP last exceeded the PCL in MW08 in 2012 and exceeded the ADEC CUL in 2018 while TCP has never exceeded the PCL in MW48.

Groundwater samples were collected from four sentry wells (MW39, MW78, MW91, MW93) located between a Fort Wainwright water supply well (Building 3559) and the TCP plume. TCP has never been detected in any of the Sentry Wells.

TCE GROUNDWATER PLUME SUMMARY

Two wells are sampled within the TCE plume; however both wells (MW61 and MW80) have had TCE concentrations less than the PCL since 2011. Statistical analysis shows a continued decreasing trend at MW61. The 95% upper confidence limit (UCL) of the regression curve suggests that remedial goals were met in 2014 at MW61. This indicates that the TCE PCL has been achieved in accordance with EPA requirements (EPA, 2014a).

Vinyl chloride, a reductive dechlorination daughter product of TCE, was detected above the ADEC CUL in MW61 in the 2019 sample. Vinyl chloride had not been discussed in recent groundwater monitoring reports and since the LOD has been above the current ADEC CUL, it is unclear whether the 2019 result is an outlier. Using a method and/or laboratory that has an LOD below the ADEC CUL should be pursed in future sampling events.

INSTITUTIONAL CONTROL INSPECTION SUMMARY

The annual IC inspection of OU6 was conducted during September 2019. The purpose of the inspection was to evaluate the implementation and effectiveness of ICs, to verify that ICs continue to function as intended, and to identify corrective actions based on findings of the site inspection. The only IC deficiency was intentional excavation (probably by dogs) in the backyards of several residences. The Army contacted the housing operator who issued notices to the four residents where holes were observed in their backyards and the deficiencies were corrected.

1.0 INTRODUCTION

This report presents results of the 2019 groundwater monitoring conducted at the Operable Unit 6 (OU6) Former Communications Site (FCS) on Fort Wainwright, Alaska during May 2019; two wells were also resampled in August 2019. Fairbanks Environmental Services, Inc. (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE), Contract Number W911KB-16-D-0005, Task Order W911KB18F0053. The work was completed according to the 2019 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan (FES, 2019), under authority of CERCLA; and in compliance with the OU6 Record of Decision (ROD), Federal Facility Agreement (FFA), and state of Alaska regulations.

The primary objectives for the 2019 work at the OU6 FCS described in this report include the following:

- Collect and analyze groundwater for contaminants of concern (COCs) as presented in the OU6 ROD (USACE, 2014a), previously detected contaminants (USACE, 2012b), and geochemical parameters.
- Compare results with ROD-established project cleanup levels (PCLs) (USACE, 2014a); the newly issued Alaska Department of Environmental Conservation (ADEC) cleanup levels (ADEC, 2018) are presented for reference.
- Assess current and historical results to identify contaminant trends and predict cleanup dates.
- Review geochemical data for consistency with the selected remedy of monitored natural attenuation (MNA).
- Summarize findings of the Institutional Control (IC) inspections conducted at OU6 during 2019.

1.1 Project Overview and Monitoring Report Organization

The 2019 sampling effort evaluates progress towards achieving remedial objectives in groundwater. The data collected are compared to historical data to evaluate trends in contaminant attenuation over time. A description of the procedures and results associated with these activities are presented in the following sections:

- Section 2 – Field Activities Summary
- Section 3 – Groundwater Sample Results
- Section 4 – Contaminant Trend and Plume Analysis
- 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, is provided in the Supplemental Information folder on the compact disc accompanying this report.

- Appendix A – Groundwater Sample Summary and Analytical Results
- Appendix B – Chemical Data Quality Review (CDQR) and ADEC Laboratory Data Review Checklists
- Appendix C – Groundwater Sampling Forms and Field Notes
- Appendix D – Photographic Log
- Appendix E – Monitoring and Remediation Optimization System (MAROS) Software Concentration Trend and Plume Stability Results
- Appendix F – Survey Report

1.2 OU6 Source Area Tracking

The OU6 source area is tracked in the ADEC Contaminated Sites database, which is maintained by the ADEC project manager assigned to the source area and by the Army in the Headquarters Army Environmental System (HQAES) for funding purposes. Source area identification and historical spill numbers are presented in Table 1-1.

Table 1-1. Summary of OU6 Source Area Tracking Numbers

Source Area Name	ADEC File Numbers[1]	ADEC Spill Numbers	ADEC Hazard ID	Army HQAES Number[1]
OU6 Former Communications Site (Taku Gardens)	108.38.085	05309914702 05309914703 06309911001 06309931201	4140	02871.1088

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

1.3 Project Location and Background

1.3.1 Site History

The OU6 FCS is commonly referred to as the Tanana Trails Family Housing Development, formerly known as Taku Gardens. This site is located on Fort Wainwright, an active U.S. Army installation occupying a 911,604-acre military reservation east of Fairbanks, Alaska (Figure 1-1). The OU6 FCS is located between Alder and Neely Roads, south of the Basset Army Hospital. OU6 previously contained or was used for barracks, company headquarters, communications and radar systems, salvage/reclamation yard activities, debris disposal, firefighting training, and

possible ammunition storage. The site was selected for construction of future military housing in 2002/2003, and construction began in 2005.

During construction of the housing development in 2005, environmental contamination of soil and groundwater was found. Characterization and remedial activities conducted between 2005 and 2013 identified polychlorinated biphenyls (PCBs), petroleum compounds, chlorinated compounds, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and discarded military munitions and munitions debris. Two of the VOCs that were found to persist in groundwater plumes were trichloroethene (TCE) and 1,2,3-trichloropropane (TCP). The TCE and TCP plumes were likely related to historical salvage and waste operations at the FCS between 1942 and 1962 (USACE, 2010).

1.3.2 Investigation Summary

Groundwater monitoring to assess contaminant levels, contaminant trends, and the effectiveness of the ROD-selected remedy of MNA at this site began in 2005, continued through the Remedial Investigation (RI) (USACE, 2010), and continues into the present. There are no data from 2013 to 2015, either because data were not accepted or because sampling did not occur during these years. Since 2005, 95 monitoring wells have been installed at the FCS. The following is a summary of the investigation history at the FCS:

- Initially, 13 temporary monitoring wells, wells generally used to aid in determining the optimal locations for the permanent wells, were installed and sampled during Preliminary Source Evaluations (PSEs) that were conducted between 2005 and 2006.
- An RI was conducted between 2007 and 2010
    - In 2007, 64 monitoring wells were installed to investigate and delineate potential groundwater contamination and to collect data for use in a risk assessment (USACE, 2010).
    - In 2008, five additional monitoring wells were installed to delineate the boundaries of the contaminated groundwater plumes (USACE, 2010).
    - In 2009, nine additional monitoring wells were installed as part of the TCP investigation to delineate TCE and diesel range organics (DRO) plume boundaries (USACE, 2010).
- Post-RI activities were conducted between 2010 and 2017
    - In 2010, two deep monitoring wells (sentry wells) were installed outside of the fence on the northeast boundary of the FCS to determine whether TCP contamination threatened the FWA drinking water supply wells (USACE, 2012a).
    - In 2012, one deep monitoring well (sentry well) was installed between the TCP plume and the FWA drinking water supply wells within the capture zone of the FWA drinking water supply wells (USACE, 2013).

- In 2013, two unusable wells were decommissioned and two permanent monitoring wells were installed to serve as replacement monitoring wells (USACE, 2014b).
- In 2016, 57 monitoring wells were decommissioned or abandoned in place with the approval and guidance of ADEC (USACE, 2018a).
- In 2017, six additional monitoring wells and one temporary well were decommissioned (USACE, 2018b).

1.3.3 Remedial Summary

Debris, drums, munitions-related items, and contaminated soil encountered during the series of investigation activities were removed to the greatest extent practical and properly disposed of, including an estimated 3,368 cubic yards (CY) of PCB-contaminated soil; 66 CY of pesticide-contaminated soil; and 3,354 CY of petroleum, oil, and lubricants (POL)/solvent-contaminated soil (USACE, 2014b). In addition, 2,934 items of munitions-related debris and 1,061 drums were disposed of. Soil contaminated with POL and residual concentrations of VOCs, SVOCs, pesticides, and explosive compounds remains in the subsurface between 5 and 15 feet below ground surface (bgs).

1.3.4 Long Term Monitoring

Between 2005 and 2013, a total of 95 monitoring wells were installed, including three deep monitoring wells (sentry wells) on the northeast boundary of the site to determine whether contamination threatened the Fort Wainwright drinking water supply wells (USACE, 2012a; 2013). Five groundwater plumes have been identified: one TCE plume; one 1,2,3-TCP plume; one main DRO plume; and two smaller DRO plumes associated with wells MW62 and MW77.

The Remedial Design/Remedial Action (RD/RA) Work Plan (USACE, 2015) identified 25 existing wells for continued monitoring to support the ROD-selected remedy of MNA (USACE, 2014a). Groundwater COCs at the FCS are TCE, TCP, DRO, and residual range organics (RRO). Although the OU6 ROD identified TCE as a COC (USACE, 2014a), TCE concentrations have been below the PCL since 2011.

1.4 Regulatory Considerations

Remedial Action Objectives (RAOs) and PCLs for groundwater were identified in the OU6 ROD (USACE, 2014a) and are summarized below.

1.4.1 Remedial Action Objectives

The OU6 ROD established the following RAOs for groundwater COCs at the OU6 FCS:

- Protect against human exposure to COCs in soil. This RAO will be achieved if COCs in soil at concentrations exceeding PCLs are managed through administrative processes, or if COCs in soil meet PCLs.
- Protect against human exposure to COCs in groundwater. This RAO will be attained if the exposure pathway to human receptors is limited or eliminated through administrative processes, or if COC concentrations in groundwater are reduced to meet PCLs.
- Return groundwater to its beneficial use as a drinking water source. VOCs are expected to reach PCLs within 25 years; it is expected that remediation of DRO and RRO will take longer. This RAO will be achieved when groundwater COCs meet PCLs.

1.4.2 Project Cleanup Levels

Based on the results of the baseline risk assessment for current and projected land use at the site, COCs were identified and PCLs were established. Table 1-2 presents the PCLs for the OU6 FCS COCs identified in the ROD.

Table 1-2. OU6 Project Cleanup Levels for Groundwater

COCs	ROD PCLs (µg/L)
1,2,3-TCP	0.12
TCE	5
DRO	1,500
RRO	1,100

µg/L – micrograms per liter

In addition to groundwater sample result comparison to PCLs, results were also compared to current ADEC CULs (Title 18 of the Alaska Administrative Code [AAC], Chapter 75.345, Table C [ADEC, 2018]). Sample results which exceed ADEC CULs are identified throughout the report. However, only the DRO and RRO ADEC CULs (which are equivalent to the PCLs for these constituents) are applicable for source area cleanup. All remaining constituents will undergo cleanup under CERCLA.

Notes:

1. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Operable Unit 6 Location and Vicinity

2019 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005	Figure: 1-1	Date: 1/20

2.0 FIELD ACTIVITIES SUMMARY

Groundwater sampling was conducted between May 13 and 16, 2019. Two wells were resampled on August 27, 2019. The work was completed according to the 2019 CERCLA Sites Work Plan (FES, 2019). This section discusses the sampling activities; analytical data are presented in Section 3.

2.1 Pre-sampling Activities

On May 13, 2019, 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 overcasing or well casing.

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 was also measured. Water level measurements were recorded on groundwater sampling forms (provided in Appendix C) and are further discussed in Section 3.1.

2.2 Groundwater Sampling Procedures

Techniques used to purge and sample the groundwater were consistent with low-flow sampling methodology (Puls and Barcelona, 1996) and are detailed in the OU Sites Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2016). The low-flow sampling method utilized submersible pumps and dedicated Teflon-lined tubing in all but one well (MW91); samples from MW-91 were collected using a disposable bladder pump because the top of this well is damaged below the ground surface, resulting in the inability to lower a submersible pump to the screen depth.

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, 2019). 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), and oxidation/reduction potential (ORP). Field parameters are discussed further in Section 2.3.2. In addition, turbidity and drawdown were measured for each well and were recorded on sampling forms. Groundwater sampling forms are presented in Appendix C, and a summary of the field parameters is provided in Appendix C, Table C-1. A photographic log of groundwater sampling activities is provided in Appendix D.

2.3 OU6 Groundwater Sampling Program Summary

2.3.1 2019 Groundwater Monitoring Changes

Several changes to the groundwater sampling program were made in 2019 after approval by the Remedial Project Managers. The changes included the following:

- Reduction of the groundwater sampling frequency from semi-annual to annual.
- Sampling and analysis of several natural attenuation parameters were removed from the OU6 groundwater monitoring program. The analyses discontinued include dissolved phosphorous and potassium, alkalinity, methane, ammonia as nitrogen, and nitrate/nitrite as nitrogen. Analysis of dissolved iron/manganese and sulfate remain in the sampling program. There are no changes to the sampling program with respect to contaminant constituents.
- A re-survey of all 25 monitoring wells conducted in September 2019 to improve accuracy of groundwater contours and determination of groundwater flow direction.

2.3.2 Contaminant and Geochemical Parameter Monitoring

Groundwater samples were collected from 21 monitoring wells and were submitted for the analyses as indicated in Table 2-1. The locations of the wells are shown on Figure 2-1. All samples were analyzed by Agriculture & Priority Pollutants Laboratories, Inc. (APPL) of Clovis, California. The sample summary and analytical results tables are presented in Appendix A. An evaluation of data quality is detailed in the CDQR and ADEC Laboratory Data Review Checklists. The CDQR and ADEC Checklists are provided in Appendix B.

Table 2-1. OU6 Groundwater Sampling Summary

Contaminant Area	Number of Wells	Monitoring Wells	Analytical Parameters
Background	2	MW03, MW13	(VOC [low-level]), MNA Parameters[2]
DRO Plumes	13	MW06A, MW12R, MW28, MW32R[1], MW33, MW35, MW37, MW38, MW58, MW62, MW64, MW77, MW82	(VOC [low-level])[1], DRO/RRO, MNA Parameters[2]
1,2,3-TCP Plume	4	MW08, MW47, MW48, MW79	VOC [low-level], MNA Parameters[2]
TCE Plume	2	MW61[3], MW80[3]	VOC [low-level], MNA Parameters[2], VOC[3]
Sentry Wells	4	MW39, MW78, MW91, and MW93	VOC [low-level], MNA Parameters[2]

[1] Well MW32R was the only DRO plume well to be analyzed for low-level VOCs.
[2] Monitored natural attenuation (MNA) parameters include dissolved iron/manganese and sulfate
[3] Samples collected from MW61 and MW80 were inadvertently submitted for analysis of low-level VOC's by the EPA 8260C-SIM method instead of VOCs by EPA 8260C. Since several analytes are not included in the low-level analysis, the wells were resampled and submitted for the standard VOC analysis.

Samples collected from MW61 and MW80 during May 2019 were inadvertently analyzed by the laboratory for low-level VOCs using the Environmental Protection Agency (EPA) 8260C-SIM method instead of VOCs by EPA 8260C. Since several VOC analytes are not included in the low-level VOC analysis, the wells were resampled in August 2019 and submitted for the standard VOC analysis.

2.4 Decontamination

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

The decontamination water generated during groundwater sampling was containerized and treated using granular activated carbon (GAC). The treated water was discharged at the OU6 source area, 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.

2.5 Investigation-Derived Waste Handling and Disposal

Investigation-derived waste (IDW) generated during OU6 field activities in 2019 included purge water, decontamination water, and general refuse (disposable tubing, nitrile gloves, etc.) from groundwater monitoring activities. All IDW and other waste streams were managed according to the procedures outlined in the 2019 CERCLA Work Plan (FES, 2019).

Purge water was containerized at the time of sampling in 15-gallon polyethylene 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 purge water from OU6 was characterized using the results from individual wells and a separate toxicity characteristic leaching procedure (TCLP) analysis. The purge water from OU6 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 2019 IDW Technical Memorandum.

2.6 Monitoring Well Survey

OU6 wells were installed and surveyed during several different time periods and some wells were never surveyed. This resulted in an inconsistency of monitoring well top of casing elevations

resulting in inaccuracies of groundwater elevations. To improve the understanding of groundwater elevations and groundwater flow through the OU6 area, all OU6 monitoring wells were resurveyed during 2019.

Windy Creek Surveys of Fairbanks, Alaska conducted the horizontal and vertical survey of the monitoring wells on September 7 and 8, 2019. The surveys were conducted in accordance with the Engineering Manual 1110-1-1005 (USACE, 2007) and comply with the requirements set forth in the Manual for Electronic Deliverables (MED) (USACE, 2017). A survey summary report and summary table including the boring/well ID, X and Y coordinates, elevations, and date and time of the survey is included in Appendix F. Additional native survey files are provided in Supplemental Information on the CD accompanying this report.

2.7 Institutional Controls

IC inspections were conducted at OU6 during September 2019. The purpose of the inspection is to evaluate the implementation and effectiveness of ICs, to verify that ICs continue to function as intended, and to identify corrective actions based on findings of the site inspection. The 2019 IC inspections were conducted at the OU6 FCS in accordance with the Institutional Controls Implementation Action Plan (ICIAP), which was in the 2015 RD/RA Work Plan (USACE, 2015). The specific objectives of the ICs at OU6 are as follows:

- Prevent access to or use of the groundwater beneath OU6 until PCLs are met.
- Maintain the effectiveness of the MNA remedy for groundwater by developing specific operation and maintenance activities for the monitoring well network, which will remain in place until PCLs are met.
- Prevent unauthorized access to soil greater than 6 inches bgs until PCLs are met.

In addition to the site visit, reviews of the Fort Wainwright IC geographic information system (GIS) layer and the site-specific information in the ADEC Contaminated Sites database were conducted.

At the approval of the RPMs, IC inspection of residences were reduced from 100% to 20% beginning in 2019. In addition, any residences where IC deficiencies were noted in the 2018 IC inspection were included in the 2019 IC inspection. All public use areas (i.e. playgrounds, open area/play areas, summer lawn, and pavilion area) and the two mechanical buildings continue to be inspected annually.

A summary of the IC Inspection and findings includes:

- One dig permit was issued for the area within the OU6 IC boundary in 2019. The project involved the repair of a water line between Tanana Trails Units 4728 and 4729. The dig permit identifies that excavation and sampling must be conducted in accordance with the Post Wide UFP-QAPP.

- Intentional excavation and soil disturbance by home owners was not observed; however, observations of soil disturbance, potentially by large dogs, were noted in four residence backyards. Some of the soil disturbance areas appear to be greater than 6 inches bgs. Four of the six residences that had backyard soil disturbances in the backyard in 2018, also had similar disturbances in 2019. The Army contacted North Haven who then issued notices to the four residents where holes were observed in their backyards.
- Unauthorized installation of water wells was not observed.
- Unauthorized use of the groundwater beneath OU6 was not observed.
- All 28 wells were secured and undamaged.

Based on the findings from the source area inspections, it was determined that OU6 ICs are being implemented and are effective.

Notes:

1. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Groundwater Monitoring Wells Sampled in 2019
2019 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005	Figure: 2-1	Date: 1/20

3.0 GROUNDWATER SAMPLE RESULTS

This section presents the 2019 groundwater monitoring results for OU6. Groundwater monitoring was completed in accordance with the 2019 CERCLA Sites Work Plan (FES, 2019). Current and historical data were used to support statistical and geochemical assessments of natural attenuation of groundwater contaminated with DRO, RRO, TCP, and TCE within the OU6 source area. Complete analytical results are presented in Appendix A.

Current DRO and TCP groundwater plumes are shown on Figures 3-2 and 3-3, which also lists the 2019 PCL exceedances. Current and historical DRO exceedances identify a main plume and two additional plumes each identified by one well. In addition to the DRO plumes, current and historical TCP exceedances of the PCL in two wells define the TCP plume. Historically a TCE plume has been defined by PCL exceedances in one well, as shown on Figure 3-4.

3.1 Groundwater Elevations

Groundwater levels were measured in each well on May 13, 2019 and are shown in Table 3-1. As discussed in Section 2.6, monitoring wells were surveyed in 2019, and the top of casing elevations were used to calculate groundwater elevations in each well. The top of casing and groundwater elevations are shown on Table 3-1. Groundwater elevations and contours are shown on Figure 3-1 and indicate that the groundwater flow direction is towards the northwest, consistent with the regional groundwater flow direction. Groundwater elevations measured in 2019 were approximately 1.7 and 3 feet lower than the June 2018 and September 2018 elevations, respectively.

Free product was measured in MW-77 prior to sampling the well. A product thickness of 0.03 feet was measured in the well. The presence of product in the well prevented the measurement of groundwater parameters during purging of the well, but the well was sampled by lowering the pump below the groundwater-product interface.

3.2 DRO and RRO Plume Sample Results

Five wells that are currently being monitored are located within or directly adjacent petroleum contaminant plumes as shown in Figure 2-1; three wells (MW33, MW06A, and MW58) within the main DRO plume, one well directly adjacent the main DRO plume (MW12R), and two wells (MW62 and MW77) in isolated DRO plumes. Seven additional wells crossgradient or downgradient of the DRO plumes are also sampled. DRO, RRO, and MNA parameters for 2018 and 2019 sampling events are presented on Table 3-2. MNA results for background well MW13 is also included in Table 3-2 for comparison.

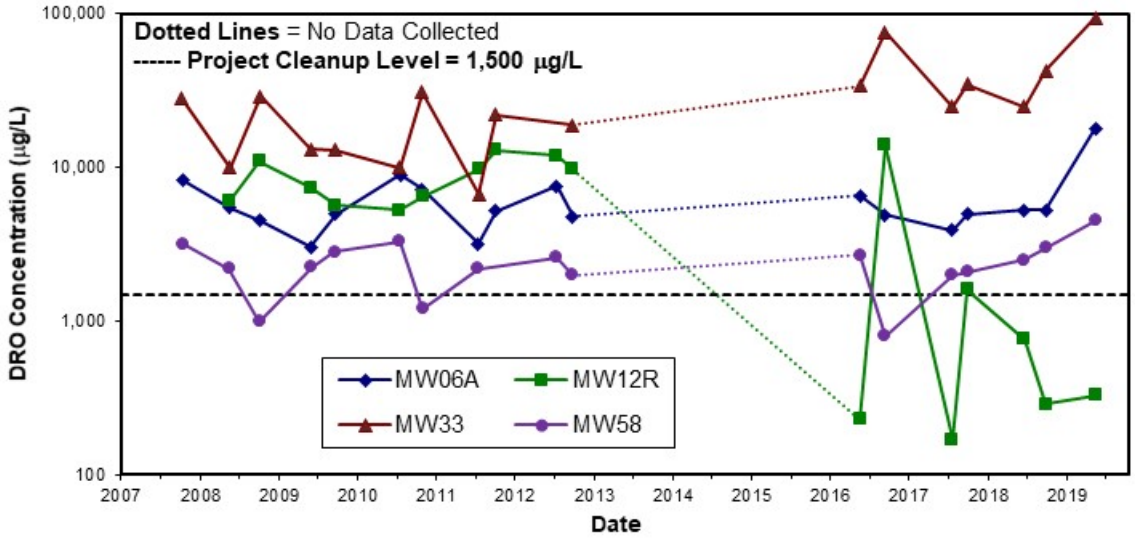
Generally, DRO concentrations were higher in 2019 than recent years which may have been the result of the lower groundwater elevations encountered at the time of the sampling event.

3.2.1 DRO and RRO in the Main DRO Plume

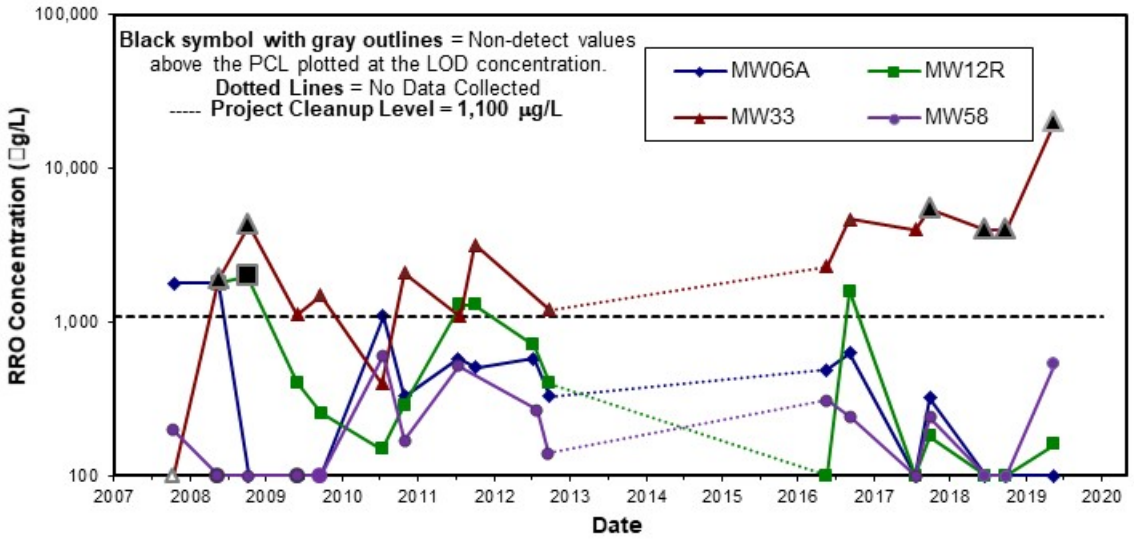
DRO concentrations exceeded the PCL in three main DRO plume wells in 2019. DRO concentrations ranged between 330 µg/L in MW12R to 95,000 µg/L in MW33. There were no RRO exceedances of the PCL, although two wells (MW33 and MW06A) had RRO LODs exceeding the PCL. When the LOD has been below the PCL, RRO has typically exceeded the PCL in MW33. Graphs 3-1 and 3-2 show time-series plots of DRO and RRO concentrations respectively, for the four main DRO Plume wells.

The 2019 DRO concentrations were the highest ever measured in both MW33 and MW06A. Potentially the lower groundwater elevations in 2019 influenced the DRO concentrations.

Graph 3-1. DRO Concentrations in the Main DRO Plume



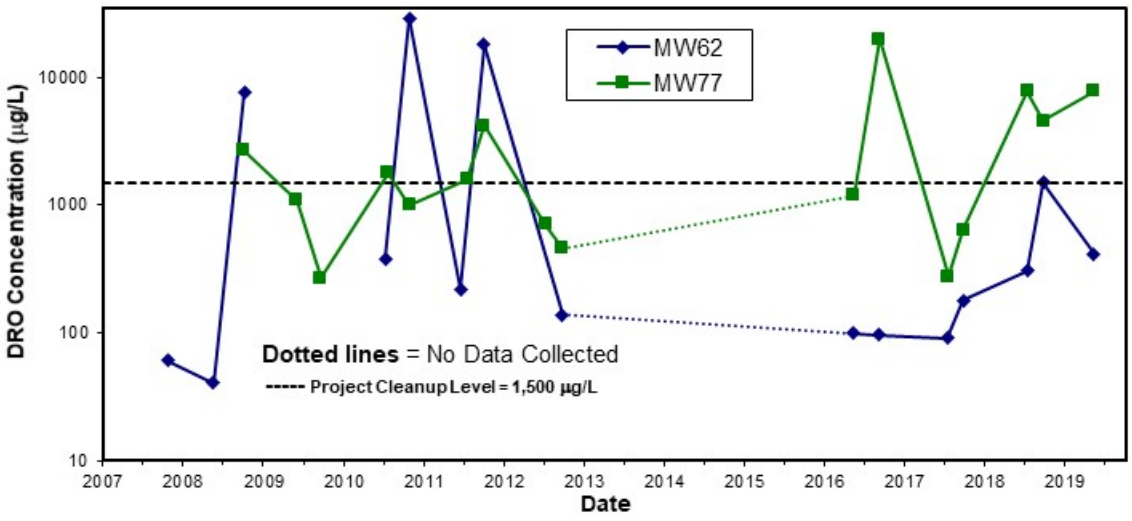
Graph 3-2. RRO Concentrations in the Main DRO Plume



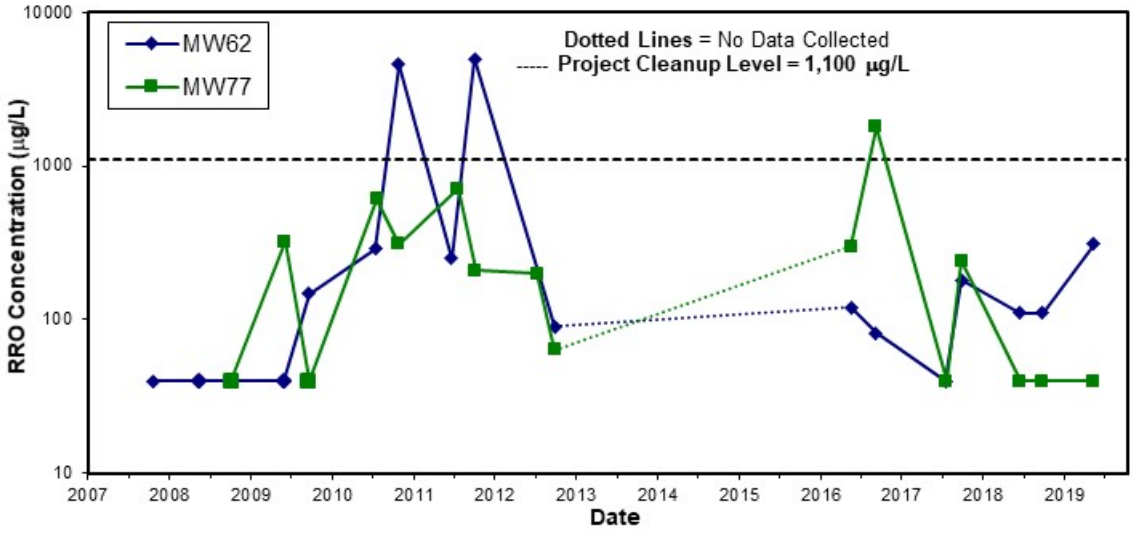
3.2.2 DRO and RRO in MW62 and MW77

Monitoring wells MW62 and MW77 are located approximately 150 and 400 feet, respectively, north-northeast of the main DRO plume. The DRO concentration exceeded the PCL in MW77 in 2019. As noted in Section 3.1, free product was measured in MW-77, however the 2019 DRO concentration in this well was similar to that measured in 2018. While the DRO concentration in MW62 equaled the PCL during the September 2018 sampling event, the concentration was less than the PCL in 2019. RRO did not exceed the PCL in either well in 2019. Graphs 3-3 and 3-4 present historical data collected at monitoring wells MW62 and MW77 for DRO and RRO, respectively.

Graph 3-3. DRO Concentrations in MW62 and MW77



Graph 3-4. RRO Concentrations in MW62 and MW77



3.2.3 DRO and RRO in Crossgradient and Downgradient Wells

Seven monitoring wells located crossgradient or downgradient of the DRO plumes are sampled. The well locations relative to the main DRO plume are as follows and are shown on Figure 3-2.

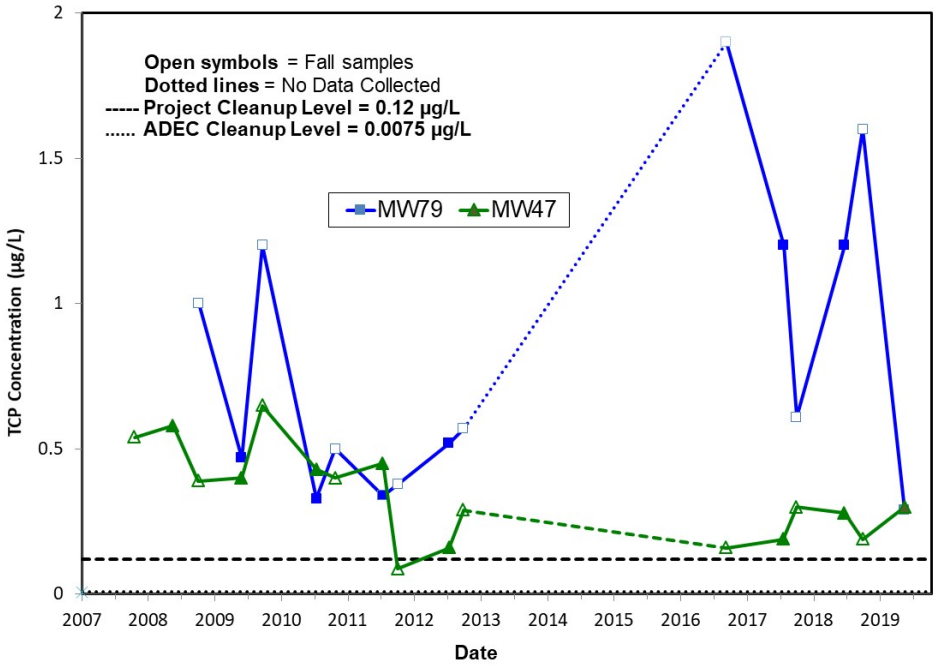
- MW28 and MW32R are located west and crossgradient from the main DRO plume.
- MW35 and MW37 are located downgradient from the main DRO Plume.
- MW64 is located downgradient of the MW62 DRO plume.
- MW38 is located crossgradient of the MW77 DRO plume
- MW82 is located downgradient of the MW77 DRO plume.

None of the wells have had DRO or RRO concentrations exceeding the PCL in any sampling event.

3.3 TCP Plume Sample Results

The TCP plume (Figure 3-3) is characterized by PCL exceedances in MW47 and MW79 in the northeast corner of the OU6 FCS. Two additional wells, MW08 and MW48 are located upgradient of MW47 and MW79; TCP last exceeded the PCL in MW08 in 2012 and exceeded the ADEC CUL in 2018. TCP has never exceeded the PCL in MW48. Results for 2018 and 2019 sampling events are included in Table 3-3. TCP concentrations exceeded the PCL both wells during the 2019 sampling event. TCP has exceeded the PCL in every sampling event since 2008 in MW79 and all but one sampling event since 2007 in MW47, as shown in Graph 3-5. As indicated in Graph 3-5, TCP has exceeded the current ADEC CUL in every sampling event of MW47 and MW79.

Graph 3-5. TCP Concentrations in MW47 and MW79



TCP has never been detected in any of the sentry wells (MW39, MW78, MW91, and MW93).

3.4 TCE Plume Sample Results

Two monitoring wells (MW61 and MW80) are sampled to evaluate the TCE and other chlorinated solvents within the FCS. As discussed in Section 2.3.2, MW61 and MW80, were sampled twice in 2019, once in May and once in August; however, TCE concentrations were reported only for the August 2019 sampling event. The 2019 sampling results for TCE are presented in Figure 3-4 and in Appendix A, Table A-2. 2018 and 2019 TCE (and associated daughter products) results are included in Table 3-3. TCE concentrations were below both the PCL and the ADEC CUL in both wells in 2019.

TCE has never exceeded the PCL in MW80. TCE concentrations have declined steadily since 2007 in MW61 and the last exceedance of the PCL (5 µg/L) was in October 2010.

Vinyl chloride exceeded the current ADEC CUL (0.19 µg/L) in the project and field duplicate samples collected from MW61 during May 2019. Vinyl chloride was not detected in this well in 2018, but the LOD was above the PCL. Vinyl chloride was not detected in MW80 in any of the 2018 or 2019 sampling events. The OU6 ROD did not identify vinyl chloride as a COC since groundwater samples did not exceed the Federal Maximum Contaminant Level (MCL) of 2 micrograms per liter (µg/L) in pre-ROD investigations. The ADEC CUL for vinyl chloride was also 2 µg/L at the time of the OU6 ROD, compared to its current value of 0.19 µg/L. Cis-1,2 dichloroethene (DCE) and trans-1,2 DCE were also detected in MW61 but were below the ADEC CUL (neither analytes have PCL's).

3.5 Natural Attenuation Evaluation

The OU6 ROD selected MNA (with ICs) as the remedy for contaminated groundwater at the FCS. To address MNA, groundwater geochemistry has been evaluated to assess the potential for biodegradation of groundwater contaminants. Fuel contaminants such as DRO are more rapidly degraded under aerobic conditions while chlorinated contaminants like TCP and TCE are more effectively degraded under reduced conditions. Groundwater at Fort Wainwright is generally only slightly aerobic with background DO concentrations typically around 2 milligrams per liter (mg/L).

The natural attenuation evaluation included analysis of field and laboratory data. Field parameters, most importantly DO and ORP, are presented on groundwater sampling forms and Table A-1 included in Appendix A. Laboratory analysis conducted in 2019 included dissolved iron, dissolved manganese, and sulfate. Analysis of methane, alkalinity, ammonium, nitrate-nitrite, potassium, and phosphate was discontinued in 2019 since the concentrations of these analytes have been established for the site and do not have significant value in further assessment of natural attenuation at the site.

3.5.1 Geochemical Conditions within the DRO Plumes

Geochemical data associated with the DRO plumes is presented in Table 3-2. For comparison purposes, data associated with background well MW13 is included. Background well MW3 is not included since the data (negative ORP and elevated dissolved iron) suggests that the well does not represent background conditions. The following summarizes interpretations of the 2019 geochemical data.

- DO concentrations were relatively low (between 0.33 and 0.68 mg/L) in all of the DRO plume wells. However, the background well MW13 also had low DO concentrations; as a result of the low DO concentrations, aerobic biodegradation would be anticipated to be limited.
- ORP values measured in all main DRO plume wells were negative, ranging from -60.4 to -153.2 mV. Surrounding ORP values ranged from -67.5 to -109.4 millivolts (mV). ORP values in MW77 were not measured in 2019 due to presences of measurable NAPL in the well. The ORP in background well MW13 was 32.9 mV. The negative ORP values within the main DRO plume are consistent with the conversion of oxygen and other electron acceptors to their reduced forms during biodegradation.
- Ferrous iron (identified by the dissolved iron analysis) is a soluble redox indicator produced under reducing conditions. Background dissolved iron concentrations at Fort Wainwright are typically around 1 mg/L as indicated by MW13. Dissolved iron in main DRO plume wells ranged between 9.9 and 45 mg/L. The highest dissolved iron concentrations are consistently measured in MW33, corresponding to the highest DRO concentration. Elevated ferrous iron concentrations indicate iron reduction likely due to biodegradation of fuel constituents (Wiedemeier et al., 1999).
- Manganese, a soluble redox indicator produced under reducing conditions, ranged between 0.906 and 3.06 mg/L in the DRO plume wells, while the manganese concentration in background well MW13 was 0.744 mg/L. The highest manganese concentrations were detected in MW33, also the location of the highest DRO concentrations. Elevated manganese concentrations indicate manganese reduction has occurred likely due to biodegradation of DRO and RRO, although to a lesser extent than iron reduction (Wiedemeier et al., 1999). Manganese exceeded the ADEC CUL in samples from all DRO plume wells and background well MW13; manganese also exceeded the ADEC CUL in two of the seven wells located crossgradient and downgradient of DRO plumes.
- Sulfate, an electron acceptor utilized under strongly reducing conditions, ranged in concentration between 4.1 and 35.4 mg/L in DRO plume wells, and compared to 41.1 mg/L in background well MW13. The lowest sulfate concentration of 4.1 mg/L was detected in MW33. Low in-plume sulfate concentrations likely reflect its conversion to sulfide during anaerobic biodegradation after consumption of the other electron acceptors (Wiedemeier et al., 1999).

The geochemical data indicate that groundwater near MW33 has the strongest reducing conditions, consistent with having the highest DRO concentrations.

3.5.2 Geochemical Conditions in the TCP Plume

Geochemical data for wells associated with the TCP Plume (MW47, MW48, and MW08) is similar to background well MW13. However, the groundwater geochemistry in MW79 is moderately reduced with elevated dissolved iron, dissolved manganese, and negative ORP. TCP is a persistent groundwater pollutant that has low abiotic and biotic degradation rates (EPA, 2014b). No microbes capable of using TCP as a carbon source for growth under aerobic conditions have been isolated, but TCP may serve as an electron acceptor under anaerobic conditions (Yan, 2009). Data are limited, so it is unclear if any biological processes are contributing to the attenuation of the TCP plume. Physical processes that might lead to observed decreases in TCP concentration include advection, dispersion, and dilution.

3.5.3 Geochemical Conditions in the TCE Plume

Elevated dissolved iron and manganese and negative ORP in the two TCE Plume wells (MW61 and MW80) indicate that groundwater in this area is reduced, creating a favorable environmental for reductive dechlorination of TCE. The presence of daughter products cis-DCE and trans-DCE in MW61 demonstrate that reductive dechlorination is occurring. With the exception of vinyl chloride in the May 2019 sample collected from MW61, all daughter products have concentrations below ADEC CULs and PCLs.

3.6 Groundwater Sample Data Quality

Project and quality control (QC) analytical data were reviewed 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 CERCLA Sites Work Plan (FES, 2019); Final Postwide UFP-QAPP (FES, 2016); ADEC Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling Technical Memo (ADEC, 2017); and United States Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.1 (DoD, 2017).

Several results were qualified as potential estimates during the data review process; however, no data were rejected. In all cases, the impact to the overall project due to the data qualifications was minor. The specific data quality issues found during the review are presented in the CDQR and ADEC Laboratory Data Review Checklists in Appendix B. The reviewed data are presented in Appendix A, Table A-2 and are used in tables and figures throughout the report.

Table 3-1. May 2019 Monitoring Well Groundwater Elevations

Well	Top of Casing (feet, NAVD88)	May 13, 2019	
		Water Level (feet BTOC)	Water Elevation (feet, NAVD88)
MW03	450.61	16.17	434.44
MW06A	450.73	16.55	434.18
MW08	453.61	18.77	434.84
MW12R	447.66	13.39	434.27
MW13	452.05	16.95	435.10
MW28	452.26	18.01	434.25
MW32R	449.05	14.93	434.12
MW33	450.64	16.42	434.22
MW35	448.66	14.70	433.96
MW37	449.94	16.02	433.92
MW38	449.49	15.36	434.13
MW39	451.31	17.02	434.29
MW47	451.27	16.72	434.55
MW48	451.44	16.71	434.73
MW58	447.96	13.82	434.14
MW61	449.88	15.46	434.42
MW62	449.02	14.76	434.26
MW64	449.58	15.33	434.25
MW77	452.62	18.61	434.01
MW78	451.66	17.31	434.35
MW79	453.45	18.79	434.66
MW80	449.43	14.99	434.44
MW82	451.74	17.99	433.75
MW91	451.77	17.45	434.32
MW93	451.69	17.36	434.33

BTOC - Below top of casing

Note: Vertical Well elevations are NAVD88 U.S. Survey Feet. (Oct 2019)

Table 3-2 - Field Measurements and Analytical Results of Background and DRO Plume Wells (2018/2019)

Location	Well Number	Date	Dissolved Oxygen (mg/L)	ORP (mv)	Dissolved Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	DRO (µg/L)	RRO (µg/L)
PCL / ADEC CUL					NE	NE/**0.43**	NE	1500/**1500**	**1100**/**1100**
Background	MW13	6/25/2018	2.32	31.6	1	0.323	39.8	NA	NA
		9/21/2018	0.60	57.2	0.455	0.0851	57.0	NA	NA
		5/13/2019	0.72	32.9	1.86	**0.744**	41.1	NA	NA
Main DRO Plume	MW12R	6/20/2018	1.15	-152.3	11.2	**1.02**	30.1	760	ND (200)
		9/26/2018	1.51	-109.0	9.32	**0.897**	33.4	290	ND (200)
		5/14/2019	0.33	-104.1	9.9	**0.906**	35.4	330 B	160 J, B
	MW33	6/20/2018	0.54	-132.0	45.9	**3.17**	4.0	**25,000**	ND (4,000)
		9/26/2018	1.30	-109.0	43.9	**3.58**	6.8	**39,000**	ND (4,000)
		5/14/2019	0.41	-109.4	45	**3.06**	4.1	**95,000 J**	ND (20,000)
	MW06A	6/20/2018	0.81	-153.2	20.2	**1.37**	16.6	**5,300**	ND (1,000)
		9/26/2018	1.19	-60.4	15.2	**1.03**	16.4	**5,300**	ND (400)
		5/16/2019	0.39	-86.5	19.5	**1.18**	12.5	**18,000**	ND (4,000)
	MW58	6/21/2018	1.63	-68.5	14	**1.13**	16.8	**2,300**	ND (400)
		9/27/2018	1.60	-108.5	15.9	**1.13**	19.2	**3,000**	ND (200)
		5/16/2019	0.68	-67.5	17.5	**1.10**	15.8	**4,500**	320 J, B
Isolated DRO Plumes	MW62	6/21/2018	0.38	14.5	1.46	**1.39**	46	310	ND (200)
		9/27/2018	0.55	18.2	1.54	**1.27**	48.5	**1,500**	ND (200)
		5/14/2019	0.63	165.1	0.127	**1.43**	79.5	450	310 J, B
	MW77	6/21/2018	0.42	47.6	0.251	**1.11**	64.3	**7,800**	ND (1,000)
		9/27/2018	0.10	19.9	ND (0.025)	**0.667**	53.9	**4,600**	ND (200)
		5/15/2019	NM	NM	0.0767 B	**0.956**	55.7	**7,800**	ND (2,000)
Crossgradient & Downgradient of DRO Plumes	MW28	6/20/2018	1.29	94.40	ND (0.025)	**1.08**	52.8	380	ND (200)
		9/26/2018	0.84	53.90	ND (0.025)	**0.925**	51.0	490	ND (200)
		5/14/2019	0.91	158.20	0.0393 J, B	**0.961**	47.1	790 B	230 J, B
	MW32R	6/25/2018	3.33	112.40	0.0266 J, B	0.0621 J	47.9	390 J	230 J
		9/21/2018	0.81	106.90	0.123	0.215	48.7	380 J	180 J
		5/13/2019	0.95	117.90	0.433	0.359	49.4	540 J	240 J
	MW35	6/21/2018	1.88	88.10	ND (0.025)	0.097	39.5	290	ND (200)
		9/26/2018	0.75	46.50	ND (0.025)	0.0735	41.9	340	ND (200)
		5/15/2019	0.74	111.90	0.0886 B	0.294	39.7	410 B	220 J, B
	MW37	6/21/2018	1.17	97.70	ND (0.025)	0.159	29.1	1,000	ND (200)
		9/26/2018	1.34	68.10	ND (0.025)	0.255	32.3	950	ND (200)
		5/14/2019	0.70	66.90	0.0774 B	**1.11**	27.9	1,400	210 J, B
	MW38	6/20/2018	1.65	53.00	0.0126	**1.36**	38.5	170	ND (200)
		9/21/2018	0.60	-52.60	7.97	**0.919**	37.2	360	ND (200)
		5/14/2019	0.70	-49.60	1.5	**1.27**	39.5	460 B	250 J, B
	MW64	6/21/2018	2.38	-15.70	2.78	0.415	12.8	ND (50)	ND (200)
		9/27/2018	1.81	-28.50	1.59	0.359	18.4	ND (50)	ND (200)
		5/16/2019	0.47	-37.4	2.92	0.423	9.4	ND (50)	ND (200)
	MW82	6/21/2018	1.87	126.10	ND (0.025)	0.0875	33.2	140	ND (200)
		9/27/2018	1.57	61.10	ND (0.025)	0.0244	43.0	ND (50)	ND (200)
		5/14/2019	0.68	102.0	0.0244 J, B	0.265	13.7	210 B	130 J, B

Results in green and bold font exceed ADEC CULs.
Results in red and bold font exceed both ROD RGs and ADEC CULs.

Acronyms:

ADEC - Alaska Department of Environmental Conservation
CUL - cleanup level
DRO - diesel range organics
RRO - residual range organics
ORP - oxidation reduction potential
mg/L - milligrams per liter
µg/L - micrograms per liter
NA - not analyzed
NM - not measured
PCL - project cleanup level
LOD - limit of detection

Data Qualifiers:

B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ or due to a QC failure
ND - not detected [LOD presented in brackets]

Table 3-3 - Field Measurements and Analytical Results of TCP and TCE Plume Wells (2018/2019)

Location	Well Number	Date	Dissolved Oxygen (mg/L)	ORP (mv)	Dissolved Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	TCP (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	cis-1,2 DCE (µg/L)	trans-1,2 DCE (µg/L)
PCL / ADEC CUL					NE	NE / **0.43**	NE	**0.12** / **0.0075**	**5** / **2.8**	**0.19**	**36**	**1100**
TCP Plume	MW47	6/25/2018	1.94	81.8	0.38 J	0.0211	37.1	**0.28**	NA	ND (0.015)	NA	NA
		9/21/2018	4.23	53.2	ND (0.025)	0.0295 J	39.5	**0.2**	NA	ND (0.015)	NA	NA
		5/13/2019	1.01	144.1	0.0483 J	0.148	32.6	**0.31**	NA	ND (0.015)	NA	NA
	MW79	6/20/2018	1.40	-21.2	3.34	**0.612**	30.9	**1.2**	NA	ND (0.015)	NA	NA
		9/26/2018	1.51	-8.7	1.88	**0.496**	42.3	**1.6**	NA	ND (0.015)	NA	NA
		5/14/2019	0.82	-55.8	10.60	**0.79**	29.2	**0.29**	NA	ND (0.015)	NA	NA
	MW48	6/25/2018	2.62	70.8	0.119	0.068	36.5	ND (0.005)	NA	ND (0.015)	NA	NA
		9/21/2018	1.01	76.3	0.027 J	0.0051 J B	48.5	ND (0.005)	NA	ND (0.015)	NA	NA
		5/13/2019	2.26	67.6	1.33	**0.866**	48.9	ND (0.005)	NA	ND (0.015)	NA	NA
	MW08	6/20/2018	1.39	117.1	ND (0.025)	0.0047 J	31.8	ND (0.005)	NA	ND (0.015)	NA	NA
		9/26/2018	1.66	123.6	ND (0.025)	0.0026 J B	31.9	**0.062**	NA	ND (0.015)	NA	NA
		5/13/2020	2.21	141.8	0.0146 J	0.0141	40.0	ND (0.005)	NA	ND (0.015)	NA	NA
Sentry Wells	MW39	6/22/2018	0.97	-116.0	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		9/20/2018	1.08	-113.6	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		5/13/2019	0.60	-105.5	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
	MW78	6/22/2018	0.94	-150.2	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		9/20/2018	1.51	-127.6	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		5/13/2019	0.37	-110.0	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
	MW91	6/25/2018	0.63	-159.2	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		9/21/2018	0.55	-118.9	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		5/13/2019	0.73	-120.2	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
	MW93	6/22/2018	0.90	-150.4	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		9/20/2018	1.07	-148.6	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
		5/14/2019	0.49	-116.7	NA	NA	NA	ND (0.005)	NA	ND (0.015)	NA	NA
TCE Plume	MW61	6/21/2018	0.84	26.9	12.2	**1.87**	40.5	ND (1.0)	0.73 J	ND (0.3)	5.0	5.9
		9/27/2018	1.58	-58.5	9.19	**2.07**	44.5	ND (1.0)	1.0 J	ND (0.3)	6.7 J	6.2 J
		5/14/2019	0.43	-68.4	10.5	**1.44**	40.2	ND (0.005)	NA	**0.42**	NA	NA
		8/27/2019	0.75	-56.6	NA	NA	NA	ND (1.0)	0.67 J	ND (0.3)	6.9 J	7.0
	MW80	6/21/2018	0.40	-5.80	10.30	**0.83**	29.2	ND (1.0)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)
		9/27/2018	1.33	-119.1	9.91	**0.801**	31.3	ND (1.0)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)
		5/15/2019	0.24	-100.4	10.6	**0.8**	31.8	ND (0.005)	NA	ND (0.015)	NA	NA
		8/27/2019	0.38	-112.1	NA	NA	NA	ND (1.0)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)

Results in green and bold font exceed ADEC CULs.

Results in red and bold font exceed both ROD PCLs and ADEC CULs.

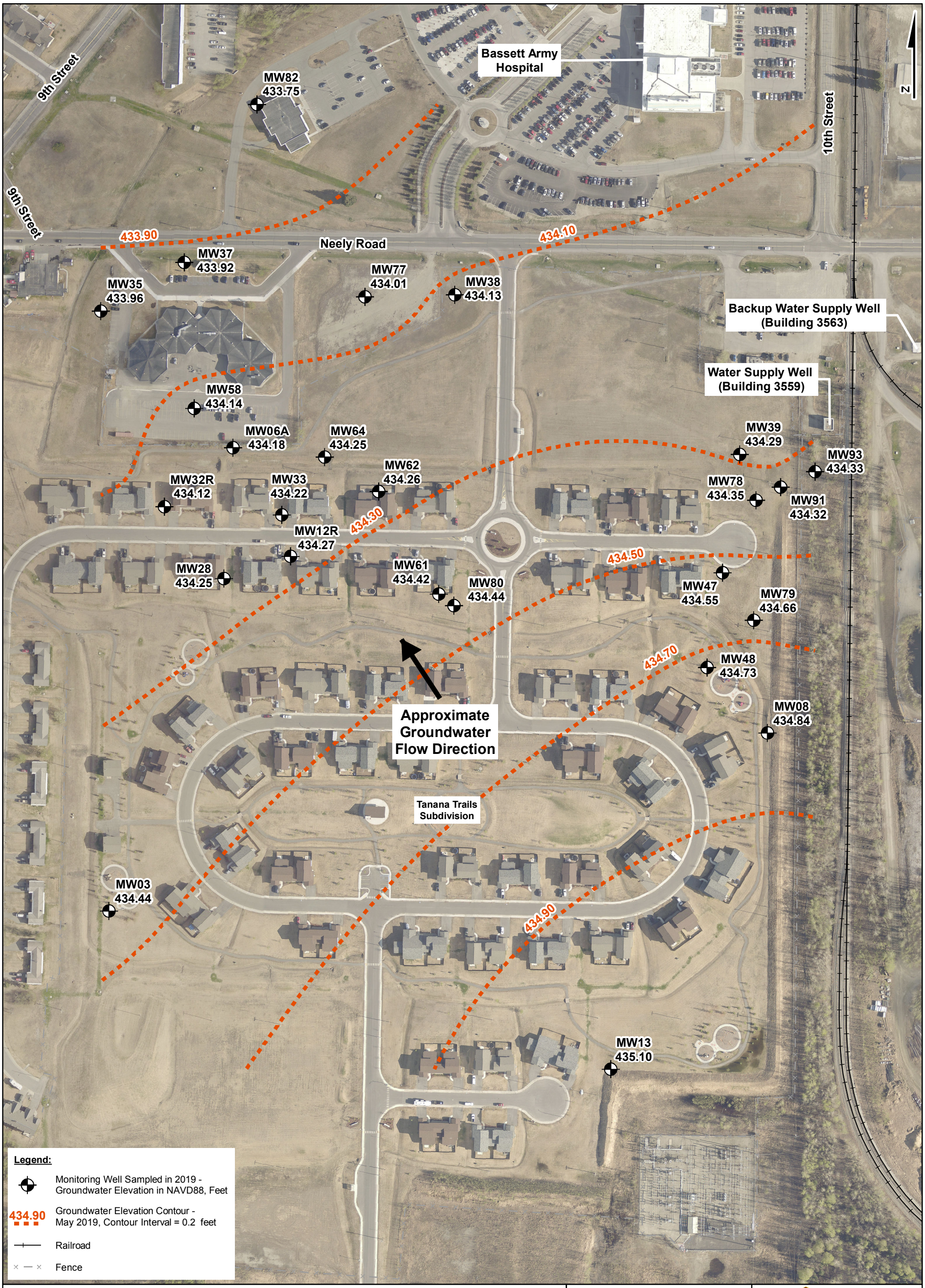
Grey shaded results are non-detect with LODs above OU6 ROD PCLs and/or ADEC CULs.

Acronyms:

ADEC - Alaska Department of Environmental Conservation
CUL - cleanup level
cis-1,2 DCE - cis-1,2 dichoroethene
trans-1,2 DCE - trans-1,2 dichoroethene
TCE - trichloroethene
TCP - 1,2,3-trichloropropane
ORP - oxidation reduction potential
mg/L - milligrams per liter
µg/L - micrograms per liter
NA - not analyzed
NM - not measured
PCL - project cleanup level
LOD - limit of detection

Data Qualifiers:

B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ or due to a QC failure
ND - not detected [LOD presented in brackets]



Notes:

1. Well survey conducted by Windy Creek Surveys, September 2019
2. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.
3. Groundwater elevations are in the North American Vertical Datum (NAVD88), feet

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Groundwater Elevation Contours
2019 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005	Figure: 3-1	Date: 1/20

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW58 Screened Interval (Ft bgs) 9.0-19.01	Oct 2007	07FWBMW58-GW(F)	3,200	200
	May 2008	08FWTMW58-GW(S)	2,200	ND (94)
	Oct 2008	08FWTMW58-GWF	1,000	100
	June 2009	09FWTMW58-GW(S)	2,250	ND (150)
	Sept 2009	09FWTMW58-GWF	2,830	ND (144)
	July 2010	10FWAMW58-GWS	3,300	610
	Oct 2010	10FWAMW58-GWF	1,200	170
	July 2011	11FWAMW58-GWS	2,200	520
	July 2012	12FWAMW58-GWS	2,600	270
	Sept 2012	12FWAMW58-GWF	2,000	140
	May 2016	16FWAMW58X-GWS	2,700	310
	Sept 2016	16FWAMW58Z-GWF	800	240
	July 2017	17FWAMW58Y-GWS	2,000	ND (220)
	Sept 2017	17FWAMW58Y-GWF	2,100	240
	June 2018	18FWOU608WG	2,300	ND (400)
	Sept 2018	18FWOU655WG	3,000	ND (200)
	May 2019	19FWOU627WG	4,500	530

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW77 Screened Interval (Ft bgs) 10.0-19.5	Oct 2008	08FWBMW77-GWF	2,700	ND (560)
	June 2009	09FWBMW77-GW(S)	1,100	322
	Sept 2009	09FWBMW77-GWF	271	ND (144)
	July 2010	10FWAMW77-GWS	1,800	610
	Oct 2010	10FWAMW77-GWF	1000	310
	July 2011	11FWAMW77-GWS	1,600	710
	Oct 2011	11FWAMW77-GWF	4,200	210
	July 2012	12FWAMW77-GWS	710	200
	Sept 2012	12FWAMW77-GWF	460	64
	May 2016	16FWAMW77-GWS	1,200	300
	Sept 2016	16FWAMW77-GWF	20,000	1,800
	July 2017	17FWAMW77-GWS	280	ND (110)
	Sept 2017	17FWAMW77-GWF	640	240
	June 2018	18FWOU615WG	7,800	ND (1,000)
	Sept 2018	18FWOU657WG	4,600	ND (200)
	May 2019	19FWOU622WG	7,800	ND (2,000)

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW06A Screened Interval (Ft bgs) 10.5-20.5	Oct 2007	07FWBMW06A-GW(F)	8,200	ND (1,800)
	May 2008	08FWBMW06A-GW(S)	5,500	ND (1,800)
	Oct 2008	08FWBMW06A-GWF	4,500	ND (960)
	May 2009	09FWBMW06A-GW(S)	3,040	ND (156)
	Sept 2009	09FWBMW6A-GWF	4,980	ND (147)
	July 2010	10FWAMW06A-GWS	9,000	1,100
	Oct 2010	10FWAMW06A-GWF	7,200	330
	July 2011	11FWAMW06A-GWS	3,200	580
	Oct 2011	11FWAMW06A-GWF	5,200	510
	July 2012	12FWAMW06A-GWS	7,600	580
	Oct 2012	12FWAMW06A-GWF	4,800	330
	May 2016	16FWAMW06A-GWS	6,600	490
	Sept 2016	16FWAMW06A-GWF	4,900	630
	July 2017	17FWAMW06A-GWS	3,900	ND (550)
	Sept 2017	17FWAMW06A-GWF	5,000	320
	June 2018	18FWOU607WG	5,300	ND (1,000)
	Sept 2018	18FWOU652WG	5,300	ND (400)
	May 2019	19FWOU629WG	18,000	ND (4,000)

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW33 Screened Interval (Ft bgs) 8.0-18.0	Oct 2007	07FWBMW33-GW(F)	28,000	ND(840)
	May 2008	08FWBMW33-GW(S)	10,000	ND (1,900)*
	Oct 2008	08FWBMW33-GWF	29,000	ND (4,300)*
	May 2009	09FWBMW33-GW(S)	13,200	1,120
	Sept 2009	09FWBMW33-GWF	13,000	1,490
	July 2010	10FWAMW33-GWS	10,000	400
	Oct 2010	10FWAMW33-GWF	31,000	2,100
	July 2011	11FWAMW33-GWS	6,700	1100
	Oct 2011	11FWAMW33-GWF	22,000	3,200
	Sept 2012	12FWAMW33-GWF	19,000	1,200
	May 2016	16FWAMW33-GWS	34,000	2,300
	Sept 2016	16FWAMW33-GWF	76,000	4,700
	July 2017	17FWAMW33-GWS	25,000	4,000
	Sept 2017	17FWAMW33-GWF	35,000	ND (5,500)*
	June 2018	18FWOU601WG	25,000	ND (4,000)*
	Sept 2018	18FWOU650WG	39,000	ND (4,000)*
	May 2019	19FWOU614WG	95,000	ND (20,000)

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW62 Screened Interval (Ft bgs) 7.0-17.0	Oct 2007	07FWAMW62-GW(F)	61	40
	May 2008	08FWAMW62-GW(S)	41	ND (94)
	Oct 2008	08FWAMW62-GWF	7,700	ND (950)
	May 2009	09FWAMW62-GW(S)	ND(250)	ND (150)
	Sept 2009	09FWAMW62-GWF	ND(245)	ND (147)
	July 2010	10FWAMW62-GWS	380	290
	Oct 2010	10FWAMW62-GWF	29,000	4,600
	July 2011	11FWA-TAKU-MW62D	220	250
	Oct 2011	11FWAMW62-GWF	18,000	5,000
	Oct 2012	12FWAMW62-GWF	140	90
	May 2016	16FWAMW62-GWS	100	120
	Sept 2016	16FWAMW62-GWF	97	82
	July 2017	17FWAMW62-GWS	92	ND (110)
	Sept 2017	17FWAMW62-GWF	180	180
	June 2018	18FWOU613WG	310	ND (200)
	Sept 2018	18FWOU658WG	1,500	ND (200)
	May 2019	19FWOU613WG	420	310

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW12R Screened Interval (Ft bgs) 11.02-20.62	May 2008	08FWBMW12-GWB(S)	6,100	ND (1,800)*
	Oct 2008	08FWBMW12-GWF	11,000	ND (2,000)*
	May 2009	09FWBMW12-GW(S)	7,430	406
	Sept 2009	09FWBMW12-GWBF	5,670	257
	July 2010	10FWAMW12-GWS	5,300	150
	Oct 2010	10FWAMW12-GWF	6,500	290
	July 2011	11FWAMW12-GWS	9,800	1,300
	Oct 2011	11FWAMW12-GWBF	13,000	1,300
	July 2012	12FWAMW12-GWS	12,000	710
	Oct 2012	12FWAMW12X-GWF	9,700	400
	May 2016	16FWAMW12R-GWS	230	66
	Sept 2016	16FWAMW12R-GWF	14,000	1,600
	July 2017	17FWAMW12R-GWS	170	ND (1,100)
	Sept 2017	17FWAMW12R-GWF	1,600	180
	June 2018	18FWOU603WG	760	ND (200)
	Sept 2018	18FWOU649WG	290	ND (200)
	May 2019	19FWOU616WG	330	160

Acronyms and Abbreviations:

Units

µg/L - micrograms per liter

Analytes

DRO - Diesel Range Organics

RRO - Residual Range Organics

Other

ADEC - Alaska Department of Environmental Conservation

Ft bgs - feet below ground surface

ND - Not Detected (LOD presented in parenthesis)

LOD - Limit of Detection

GIS - Georgaphic Information Systems

NAVD88 - North American Vertical Datum of 1988

UTM - Universal Transverse Mercator

WGS - World Geodetic System

Legend:

Monitoring Well Sampled in 2019

Project Cleanup Level (µg/L)	
DRO	1,500
RRO	1,100

Notes:

1. Results shown in red equal or exceed the PCL/ADEC CUL.
2. * The ND result indicates that LOD is higher than the PCL/ADEC CUL.
3. All groundwater sample results are in µg/L.
4. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
5. Only sample results for wells that have exceeded the PCL/ADEC CUL since 2007 are shown.
6. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

DRO Plume Groundwater Sample Results
2019 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005 | Figure: 3-2 | Date: 1/20

Well ID	Sample Date	Sample ID	TCP Result
MW79 Screened Interval (Ft bgs) 10.0-19.5	Oct 2008	08FWAMW79-GWF	1
	May 2009	09FWAMW79-GW(S)	0.47
	Sept 2009	09FWAMW79-GWF	1.2
	July 2010	10FWAMW79-GWS	0.33
	Oct 2010	10FWAMW79-GWF	0.5
	July 2011	11FWAMW79-GWS	0.34
	Oct 2011	11FWAMW79-GWF	0.38
	JUN 2012	12FWAMW79-GWS	0.52
	Sept 2012	12FWAMW79-GWF	0.57
	Sept 2016	16FWAMW79Z-GWF	1.9
	July 2017	127FWAMW79-GWS	1.2
	Sept 2017	17FWAMW79Z-GWF	0.61
	June 2018	18FWOU618WG	1.2
	Sept 2018	18FWOU636WG	1.6
	May 2019	19FWOU605WG	0.29

Well ID	Sample Date	Sample ID	TCP Result
MW47 Screened Interval (Ft bgs) 7.0-17.0	Oct 2007	07FWAMW47-GW(F)	0.54
	May 2008	08FWAMW47-GW(S)	0.59
	Oct 2008	08FWAMW47-GWF	0.5
	May 2009	09FWAMW47-GW(S)	0.51
	Sept 2009	09FWAMW47-GWF	0.65
	July 2010	10FWAMW47-GWS	0.43
	Oct 2010	10FWAMW47-GWF	0.4
	July 2011	11FWAMW47-GWS	ND (0.45)
	Oct 2011	11FWAMW47-GWF	0.087
	JUN 2012	12FWAMW47X-GWS	0.59
	Sept 2012	12FWAMW47-GWF	0.29
	Sept 2016	16FWAMW47-GWF	0.16
	July 2017	17FWAMW47-GWS	0.19
	Sept 2017	17FWAMW47-GWF	0.3
	June 2018	18FWOU620WG	0.28
	Sept 2018	18FWOU634WG	0.19
	May 2019	19FWOU601WG	0.31

Well ID	Sample Date	Sample ID	TCP Result
MW32R Screened Interval (Ft bgs) 11.72-21.32	Oct 2007	07FWCMW32-GW(F)	ND (0.3)*
	May 2008	08FWCMW32-GW(S)	0.12
	Oct 2008	08FWCMW32-GWF	ND (0.014)
	May 2009	09FWCMW32-GW(S)	ND (0.014)
	Sept 2009	09FWBMW32-GWF	ND (0.014)
	July 2010	10FWAMW32-GWS	ND (0.3)*
	Oct 2010	10FWAMW32-GWF	ND (0.45)*
	July 2011	11FWAMW32-GWS	ND (0.1)*
	Oct 2011	11FWAMW32-GWF	ND (0.45)*
	Sept 2012	12FWAMW32-GWF	ND (0.5)*
	Sept 2016	16FWAMW32R-GWF	ND (0.04)
	July 2017	17FWAMW32R-GWS	ND (0.0025)
	Sept 2017	17FWAMW32R-GWF	ND (0.0025)
	June 2018	18FWOU620WG	ND (0.005)
	Sept 2018	18FWOU634WG	ND (0.005)
	May 2019	19FWOU609WG	ND (0.005)

Well ID	Sample Date	Sample ID	TCP Result
MW48 Screened Interval (Ft bgs) 7.0-17.0	May 2009	09FWAMW48-GWS	ND (1)*
	Sept 2009	09FWAMW48-GWF	ND (1)*
	July 2010	10FWAMW48-GWS	ND (1)*
	Oct 2010	10FWAMW48-GWF	ND (1)*
	July 2011	11FWAMW48-GWS	ND (0.2)*
	Oct 2011	11FWAMW48-GWF	ND (0.2)*
	July 2012	12FWAMW48-GWS	ND (0.2)*
	Sept 2012	12FWAMW48-GWF	ND (0.2)*
	Sept 2016	16FWAMW48-GWF	ND (0.04)
	July 2017	17FWAMW48-GWS	ND (0.0025)
	Sept 2017	17FWAMW48-GWF	ND (0.0025)
	June 2018	18FWOU620WG	ND (0.005)
	Sept 2018	18FWOU634WG	ND (0.005)
	May 2019	19FWOU604WG	ND (0.005)

Well ID	Sample Date	Sample ID	TCP Result
MW13 Screened Interval (Ft bgs) 7.0-17.0	Oct 2007	07FWDMW13-GW(F)	ND (0.3)*
	May 2008	08FWDMW13-GW(S)	0.21
	Oct 2008	08FWDMW13-GWF	ND (0.014)
	May 2009	09FWDMW13-GW(S)	ND (0.014)
	Sept 2009	09FWDMW13-GWF	ND (0.014)
	July 2010	10FWAMW13-GWS	ND (0.3)*
	Oct 2010	10FWAMW13-GWF	ND (0.45)*
	July 2011	11FWAMW13-GWS	ND (0.45)*
	Oct 2011	11FWAMW13-GWF	ND (0.45)*
	Oct 2012	12FWAMW13-GWF	ND (0.5)*
	May 2016	16FWAMW13-GWS	ND (0.1)
	Sept 2016	16FWAMW13-GWF	ND (0.04)
	July 2017	17FWAMW13-GWS	ND (0.0025)
	Sept 2017	17FWAMW13-GWF	ND (0.0025)
	June 2018	18FWOU620WG	ND (0.005)
	Sept 2018	18FWOU634WG	ND (0.005)
	May 2019	19FWOU611WG	ND (0.005)

Well ID	Sample Date	Sample ID	TCP Result
MW08 Screened Interval (Ft bgs) 9.0-19.0	Oct 2007	07FWAMW08-GW(F)	ND (0.3)*
	May 2008	08FWAMW08-GW(S)	0.023
	Oct 2008	08FWAMW08-GWF	0.23
	May 2009	09FWAMW08-GW(S)	0.024
	Sept 2009	09FWAMW08-GWF	0.034
	July 2010	10FWAMW08-GWS	ND (0.3)*
	Oct 2010	10FWAMW08-GWF	ND (0.45)*
	July 2011	11FWAMW08-GWS	ND (0.45)*
	Oct 2011	11FWAMW08-GWF	0.057
	July 2012	12FWAMW08-GWS	0.13
	Sept 2012	12FWAMW08-GWF	ND (0.5)*
	May 2016	16FWAMW08-GWS	ND (0.1)
	Sept 2016	16FWAMW08-GWF	0.03
	July 2017	17FWAMW08-GWS	0.027
	Sept 2017	17FWAMW08-GWF	0.031
	June 2018	18FWOU620WG	ND (0.005)
	Sept 2018	18FWOU634WG	0.062
	May 2019	19FWOU603WG	ND (0.005)

Neely Road
10th Street
N
MW77
MW38
MW58
MW06A
MW64
MW62
MW39
MW93
MW91
MW32R
MW33
MW78
MW12R
MW28
MW61
MW80
MW47
MW79
MW48
MW08
Approximate Groundwater Flow Direction
MW13

Acronyms and Abbreviations

Units

µg/L - micrograms per liter

Analytes

TCP - 1,2,3-Trichloropropane

Other

ADEC - Alaska Department of Environmental Conservation

Ft bgs - feet below ground surface

GIS - Georgaphic Information Systems

ND - Not Detected (LOD presented in parenthesis)

LOD - Limit of Detection

Legend:

Monitoring Well Sampled in 2019

Analyte	PCL	ADEC CUL
	(µg/L)	
TCP	0.12	0.0075

0 80 160
Feet

Notes:

1. Results shown in red equal or exceed the PCL/ADEC CUL.
2. * Indicates that the LOD for the ND result is higher than the Record of Decision project cleanup level (PCL).
3. All groundwater sample results are in µg/L.
4. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
5. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

Fairbanks Environmental Services
3538 International Street
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USAGAK

TCP Plume Groundwater Sample Results

2019 Monitoring Report
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USACE Contract: W911KB-16-D-0005 | Figure: 3-3 | Date: 1/20

Well ID	Sample Date	Sample ID	TCE Result	Vinyl Chloride Result
MW80 Screened Interval (Ft bgs) 38.0-47.5	Oct 2008	08FWAMW80-GWF	ND (0.014)	-
	May 2009	09FWAMW80-GW(S)	0.019	-
	Sept 2009	09FWAMW80-GWF	0.032	-
	July 2010	10FWAMW80-GWS	ND (0.05)	-
	Oct 2010	10FWAMW80-GWF	0.18	-
	July 2011	11FWAMW80-GWS	ND (0.45)	-
	Oct 2011	11FWAMW80-GWF	ND (0.05)	-
	July 2012	12FWAMW80-GWS	ND (0.025)	-
	Sept 2012	12FWAMW80-GWF	ND (0.05)	-
	May 2016	16FWAMW80-GWS	ND (0.1)	-
	Sept 2016	16FWAMW80-GWF	ND (0.1)	-
	July 2017	17FWAMW80-GWS	ND (0.16)	-
	Sept 2017	17FWAMW80-GWF	ND (0.16)	-
	June 2018	18FWOU624WG	ND (0.15)	ND (0.3)
	Sept 2018	18FWOU641WG	ND (0.15)	ND (0.3)
	May 2019	19FWOU625WG	NA	ND (0.015)
	Aug 2019	19FWOU631WG	ND (0.3)	ND (0.3)

Well ID	Sample Date	Sample ID	TCE Result	Vinyl Chloride Result
MW61 Screened Interval (Ft bgs) 7.0-17.0	Oct 2007	07FWAMW61-GW(F)	14	-
	May 2008	08FWAMW61-GW(S)	10	-
	Oct 2008	08FWAMW61-GWF	ND (.014)	-
	May 2009	09FWAMW61-GW(S)	9.1	-
	Sept 2009	09FWAMW61-GWF	ND (9.1)	-
	July 2010	10FWAMW61-GWS	5.6	-
	Oct 2010	10FWAMW61-GWF	7.5	-
	July 2011	11FWAMW61-GWS	3.3	-
	Oct 2011	11FWAMW61-GWF	3.4	-
	July 2012	12FWAMW61-GWS	2.1	-
	Sept 2012	12FWAMW61-GWF	2.4	-
	May 2016	16FWAMW61-GWS	1	-
	Sept 2016	16FWAMW61-GWF	1	-
	July 2017	17FWAMW61-GWS	0.94	-
	Sept 2017	17FWAMW61-GWF	1.2	-
	June 2018	18FWOU622WG	0.73	ND (0.3)
	Sept 2018	18FWOU644WG	1.0	ND (0.3)
	May 2019	19FWOU623WG	NA	0.42
	Aug 2019	19FWOU633WG	0.67	ND (0.3)

MW37 MW77 MW38 MW58 MW06A MW64 MW62 MW32R MW33 MW12R MW28 MW61 MW80 MW39 MW93 MW91 MW78 MW47 MW79 MW48 MW08 MW13

Neely Road

10th Street

N

Approximate Groundwater Flow Direction

Acronyms and Abbreviations

Units

µg/L - micrograms per liter

Analytes

TCE - Trichloroethene

Other

ADEC - Alaska Department of Environmental Conservation

Ft bgs - feet below ground surface

GIS - Georgaphic Information Systems

ND - Not Detected (LOD presented in parenthesis)

LOD - Limit of Detection

Analyte	PCL	ADEC CUL
	(µg/L)	
TCE	5	2.8
Vinyl Chloride	Not Established	0.19

Legend:

Monitoring Well Sampled in 2019

0 80 160

Feet

Notes:

1. Results shown in red equal or exceed the PCL/ADEC CUL. Results in green exceed ADEC CULs.
2. All groundwater sample results are in µg/L.
3. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
4. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

TCE Plume Groundwater Sample Results
2019 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005 | Figure: 3-4 | Date: 1/20

4.0 CONTAMINANT TREND AND PLUME ANALYSIS

This section presents contaminant trends and plume analysis. Current and historical data were used to support statistical analysis using the MAROS and EPA Groundwater Statistics Tool software and geometric regression plots.

4.1 Statistical Evaluation of Contaminant Concentration Trends

Groundwater monitoring data collected between 2007 and 2019 were used to conduct a statistical evaluation of groundwater contamination in the FCS. This evaluation builds on the results of previous analyses, and documents the progress towards achieving the RAOs described in the OU6 ROD (USACE, 2014a). The analysis tools and decision criteria are consistent with the previous analyses and recommendations from the RD/RA Work Plan for OU6 (USACE, 2015). The statistical tests used in this evaluation for individual wells include the nonparametric Mann-Kendall trend test, and a geometric (lognormal) regression plot for those wells statistically demonstrating a decreasing trend. Statistical tests for plume-wide evaluation included spatial moment analysis (for plume stability), the Delaunay method (for well redundancy), and the modified Cost-Effective Sampling (CES) method (for sampling frequency). The Mann-Kendall trends, spatial moment analysis, Delaunay evaluation, and CES method were calculated using the MAROS software developed by the Air Force Center for Engineering and the Environment (AFCEE, 2006).

Geometric regression plots were calculated using the Groundwater Statistics Tool developed by the EPA (EPA, 2014a). The Groundwater Statistics Tool also provides an evaluation of whether or not a cleanup level has been met for a particular COC by calculating the 95% upper confidence limit (UCL) on the mean. For wells with decreasing trends, the tool can predict when to expect the cleanup level may be achieved. EPA recommends a minimum of eight data points should be used for these calculations to provide confidence that the cleanup level has been met and is expected to continue to be met (EPA, 2014b). If a well has achieved the cleanup level for all COCs at this level of confidence, it may be recommended for removal from the monitoring program and decommissioning. The complete analysis results are presented in Appendix E.

4.2 DRO and RRO Trend and Plume Analysis

4.2.1 DRO and RRO Trend Analysis

The DRO evaluation in the main DRO plume included several elements from the MAROS software; including Mann Kendall trends of contaminant concentrations in individual wells, Mann-Kendall trends for contaminant plume stability (spatial moment analysis), the Delaunay method for sampling location optimization, and the modified CES method for sampling frequency optimization. The evaluation of RRO consisted of Mann-Kendall trends in individual wells only, since RRO has been detected above the PCL in only two wells and there was not sufficient

information to conduct a plume-wide evaluation. The Mann-Kendall trends for DRO and RRO concentrations in individual wells within the DRO plumes are presented in Table 4-1. The results are associated with wells that have had PCL exceedances of DRO and/or RRO since 2007.

Table 4-1. Mann-Kendall Trend Results for the DRO Plumes

Well ID	Analyte	Mann-Kendall Statistic	Coefficient of Variation	Trend Confidence	Mann-Kendall Trend[1]
MW06A	DRO	10	0.54	63.2%	**No Trend (Stable)**
MW12R	DRO	-38	0.80	93.6%	Probably Decreasing *(Stable)*
	RRO	-14	1.16	70.1%	No Trend
MW33	DRO	58	0.77	99.1%	**Increasing**
	RRO[1]	60	0.85	100%	Increasing[2]
MW58	DRO	16	0.39	72.9%	**No Trend (Stable)**
MW62	DRO	27	2.34	85.6%	No Trend
	RRO	23	2.26	81.5%	No Trend
MW77	DRO	21	1.44	81.3%	**No Trend**
	RRO	-25	1.29	85.7%	No Trend

BOLD indicates the concentration was above the PCL in 2019

[1] The previous year trend is shown in parenthesis if there was a change.

[2] Trend for RRO in MW33 based on data between 2007 and July 2017 due to elevated LODs in data between September 2017 and May 2019

The Mann-Kendall trend results for DRO in Table 4-1 show an increasing trend in one source area well (MW33), no trend in four wells (MW06A, MW58, MW62, and MW67), and a probably decreasing trend in one well (MW12R). MW33 has had the highest DRO concentrations within the main DRO plume, with concentrations consistently more than an order of magnitude higher than the PCL. This suggests that the well is located in an area with residual non-aqueous phase liquids (NAPL) in the soil that continues to be solubilized in the groundwater. MW06A located immediately downgradient of MW33 had no trend but had changed from a stable trend from the previous year; this was a result of the 2019 DRO concentration being the highest ever measured in the well.

The furthest downgradient well in the main DRO plume (MW58) also has persistent DRO concentrations above the PCL and no trend. Sentry wells downgradient of MW58 (MW35 and MW37) consistently have DRO detections below the PCL. All of these results suggest that the main DRO plume is not expanding.

Mann-Kendall trend results for RRO were determined for the four wells (MW12R, MW33, MW62, and MW77) which have historically exceeded the PCL. The RRO trend in MW33 is increasing and although the RRO concentrations has not been detected in this well since July 2017, the LOD has exceeded the PCL in each subsequent sampling event. The remaining wells (MW12R, MW62, and MW77) all have no trends and RRO has not been detected in these wells since 2017.

In MW62, DRO and RRO have been detected at or below the PCL in eight consecutive sampling events (including 2019). Although the DRO and RRO concentrations have shown wide variation in the past, sampling results since 2012 have been generally consistent which indicates the residual NAPL in the surrounding soil may be depleted. DRO and RRO concentrations in downgradient well MW64 have also remained below the PCL, indicating natural attenuation may have reduced groundwater contamination to below the PCL upgradient of this well.

4.2.2 DRO Trend Analysis Using EPA Groundwater Statistics Tool

Geometric regression analysis and estimation of the time to cleanup using the EPA statistics tool was completed for DRO in MW12R, since this was the only well within the DRO plumes with a decreasing trend based on decreasing Mann-Kendall trend analysis. The results of the analysis are summarized in Table 4-2, and the complete results are presented in Appendix E.

Table 4-2. Statistical Evaluation of DRO in MW12R

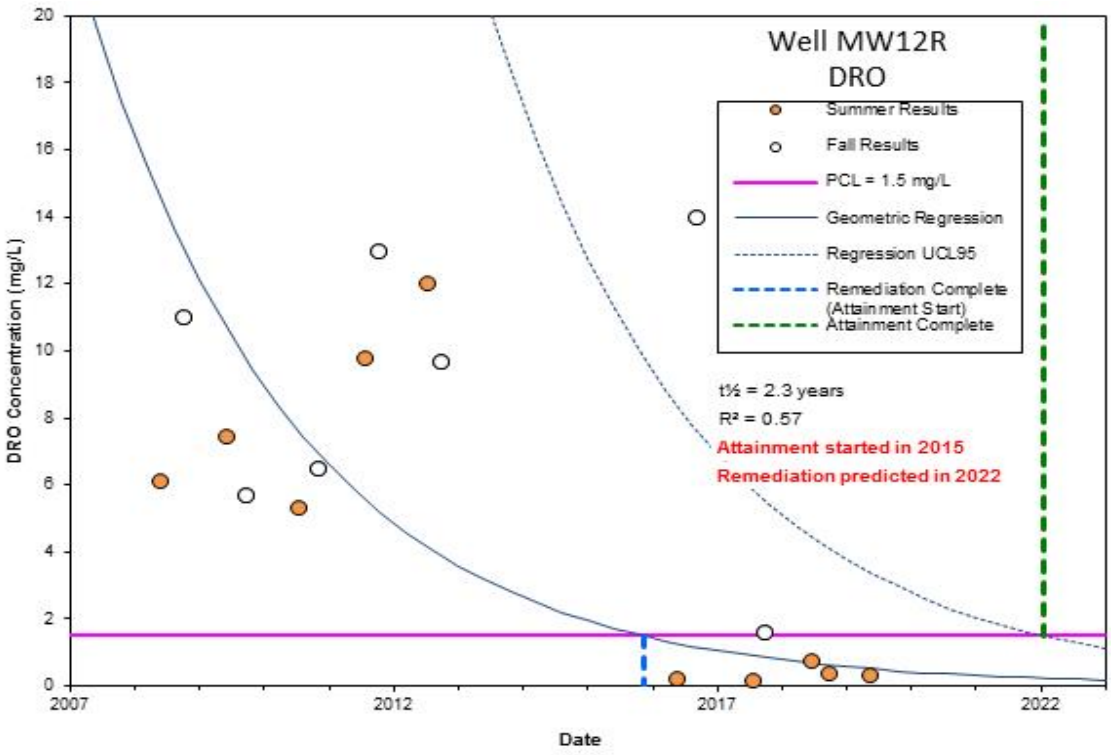
Well ID	Trend Result	Number of Data Points	95% UCL	Has PCL been Achieved?	Year Expected to Achieve PCL based on 95% UCL? ("Attainment Complete")[1]
MW12R	Decreasing	17	8,180	No	2022

The analysis is based on the EPA Groundwater Statistics Tool, available from https://www.epa.gov/superfund/superfund-groundwater-groundwater-response-completion

[1] The Attainment Complete date was determined from the geometric regression plot (Graph 4-1)

The geometric regression plot is presented in Graph 4-1, and shows that DRO concentrations were expected to achieve the PCL in 2015 (identified in the graph as "Remediation Complete", also defined by EPA as "Attainment Start"). The geometric regression plot for MW12R based on the 95% UCL indicates that statistical attainment (defined by EPA as "Attainment Complete") of the PCL could be achieved by 2022 if the present trend continues.

Graph 4-1. Geometric Regression of DRO Concentrations at MW12R



4.2.3 DRO and RRO Plume Analysis

Further evaluation of the stability of the main DRO plume was conducted using the spatial moment analysis tools associated with the MAROS software. The analysis consisted of the zeroth moment (estimate of contaminant dissolved mass), first moment (estimate of the location of the center of mass relative to the source), and the second moment (estimate of plume spread in the direction of and perpendicular to groundwater flow). One of the most important input parameters for this analysis is the makeup of the monitoring network. The results can be easily biased if different wells or different numbers of wells are included in the various monitoring events associated with the analysis. Since the same network of wells was sampled between 2016 and 2019, data from this time period for the main DRO plume wells (MW06A, MW12R, MW33, and MW58) and surrounding wells (MW28, MW32R, MW35, MW37, MW64, and MW82) were used in the spatial moment analysis. A summary of the plume stability results for the main DRO plume network is presented in Table 4-3. The complete results are presented in Appendix E.

Table 4-3. Plume Stability Results for the Main DRO Plume Network

Plume Stability Parameter	Mann-Kendall DRO Trend [1]
Zeroth Moment (Dissolved Mass)	No Trend
First Moment (Distance from the Source to the Center of Mass)	No Trend
Second Moment (Plume Spread)	
Parallel to Groundwater Flow	No Trend
Perpendicular to Groundwater Flow	No Trend

[1] Based on monitoring results between 2016 and 2019

The plume stability results indicate there is no trend for the dissolved DRO mass since 2016. There has been wide variation in DRO concentrations over time in several wells due to fluctuations in groundwater elevations and residual NAPL remaining in source area soils; however, this has not resulted in a significant change in overall dissolved mass within the DRO plume. The first moment results indicate there is no trend in the distance from the source to the center of mass since 2016. Between 2017 and 2019 the center of mass has varied between 186 to 223 feet from the source, with the center near MW06A.

The second moment results indicate no trend in the plume spread parallel to groundwater flow, which is consistent with the trend result associated with DRO concentrations in individual wells. These results suggest there is no downgradient migration of DRO above the PCL from the source area. No trend was also determined for DRO perpendicular to groundwater flow. This trend is likely a result of the variation observed in DRO concentrations throughout the main DRO plume, since no exceedances of the PCL for DRO have been observed outside of the four wells that are associated with the main DRO plume. This trend will continue to be evaluated in future monitoring events.

4.2.4 DRO Plume Redundancy and Sample Frequency Analysis

In addition to stability of the DRO plume, potential redundancy of the monitoring network and sampling frequency were evaluated using the MAROS software. The complete analysis results are presented in Appendix E and are summarized in this section. Results from the monitoring well redundancy evaluation showed that the DRO plume is primarily characterized by a moderate level of uncertainty, and suggests the DRO plume has been adequately delineated. In addition, the redundancy evaluation did not recommend removal of any wells from the monitoring network. This is supported by the qualitative observation that the wells surrounding the main DRO plume area are the most immediate downgradient wells for the main DRO plume and/or the MW62 and MW77 DRO plumes.

The sampling frequency evaluation showed that annual sampling would be sufficient to monitor DRO concentration changes over time in the main DRO plume. Previous analysis has shown that there is not a strong seasonal effect on DRO concentration in the main DRO plume area, with the exception of concentrations in MW33 (USACE, 2018b). However, the May 2019 sampling event had some of the lowest groundwater elevations and MW33 had a historical high DRO concentration. In areas where residual NAPL exists, typically highest contaminant concentrations are measured when groundwater elevations are lowest as NAPL is allowed to drain from soils onto the groundwater surface.

4.3 TCP Trend Analysis

4.3.1 TCP Mann-Kendall Trend Analysis

The TCP plume was evaluated using Mann-Kendall concentration trends from the MAROS software, and geometric regression for wells with a decreasing trend. The Mann-Kendall trends for the TCP concentration in each of the wells is presented in Table 4-4.

Table 4-4. Mann-Kendall Trend Results for the TCP Plume, MW47 and MW79

Well ID	Analyte	Mann-Kendall Statistic	Coefficient of Variation	Trend Confidence	Trend
MW47	TCP	-44	0.58	97.4%	**Decreasing**
MW79	TCP	21	0.69	83.6%	**No Trend**

BOLD indicates the concentration was above the PCL in 2019

The trend results show the TCP concentration is decreasing in downgradient well MW47, and exhibits no trend in well MW79. Concentrations were above the PCL in both wells during 2019, and have been consistently detected above the PCL since analysis began in 2007. However, TCP has remained below the PCL outside of the TCP plume; including upgradient wells, and wells that are in the downgradient, but slightly crossgradient direction, suggesting minimal plume spread from the source area.

4.3.2 TCP Trend Analysis Using EPA Groundwater Statistics Tool

The TCP concentrations in MW47 were further evaluated using the EPA Groundwater Statistics tool since the concentrations exhibited a decreasing trend. MW79 was not evaluated since the well does not have a decreasing TCP trend. The TCP concentration in MW08 was also evaluated, since this upgradient well has had several PCL exceedances since 2007 (most recently in July 2012) and has a visually obvious trend (Mann-Kendall analysis was not performed due to the inconsistent detections). The results of the analysis are summarized in Table 4-5, and the complete results are presented in Appendix E.

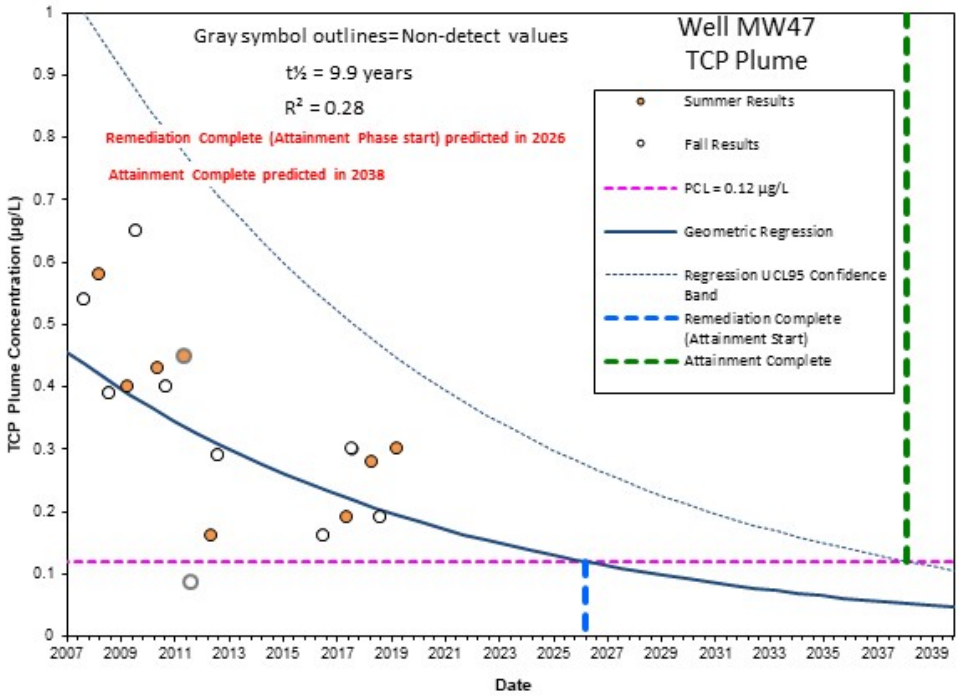
Table 4-5. Statistical Evaluation of TCP in MW47 and MW08

Well ID	Trend Result	Number of Data Points	95% UCL	Has PCL been Achieved?	Year Expected to Achieve PCL based on 95% UCL? ("Attainment Complete")[1]
MW47	Decreasing	16	0.52	No	2038
MW08	Decreasing	14	0.12	No	2024

The analysis is based on the EPA Groundwater Statistics Tool, available from https://www.epa.gov/superfund/superfund-groundwater-groundwater-response-completion
[1] The Attainment Complete date was determined from the geometric regression plot (Graph 4-2)
UCL – Upper Confidence Limit

The geometric regression plot for MW47 (Graph 4-2) shows that TCP exhibits a decreasing trend and that TCP concentrations are expected to achieve the PCL in 2026 (identified in the graph as "Remediation Complete", also defined by EPA as "Attainment Start"). The geometric regression plot for MW47 based on the 95% UCL indicates that statistical attainment (defined by EPA as "Attainment Complete") of the PCL could be achieved by 2038 if the present trend continues. A decreasing trend is also observed in MW08, and the concentration is expected to achieve the PCL based on the 95% UCL in 2024.

Graph 4-2. Geometric Regression of TCP Concentrations at MW47



The current ADEC cleanup level for TCP in groundwater is 0.0075 µg/L (ADEC, 2018), and further evaluation of the TCP concentrations in groundwater relative to the ADEC cleanup level is expected after attainment of the PCL is achieved.

4.4 TCE Trend Analysis

TCE concentration trends were evaluated using the Mann-Kendall test from the MAROS software, and the cleanup complete evaluation was completed using geometric regression and the EPA Statistics Tool.

4.4.1 TCE Mann-Kendall Trend Analysis

The Mann-Kendall trend analysis for MW61 is summarized in Table 4-6. A trend for MW80 was not determined since TCE has not been detected in this well since 2010. The Mann-Kendall trend results in Table 4-6 show TCE concentrations are decreasing with 100 percent confidence.

Table 4-6. Mann-Kendall Trend Results for the TCE Plume, MW61

Well ID	Analyte	Mann-Kendall Statistic	Coefficient of Variation	Trend Confidence	Trend
MW61	TCE	-117	0.96	100.0%	Decreasing

4.4.2 TCE Trend Analysis Using EPA Groundwater Statistics Tool

Based on the Mann-Kendall result, the TCE concentrations were further evaluated using the EPA Groundwater Statistics tool, and the results are summarized in Table 4-7.

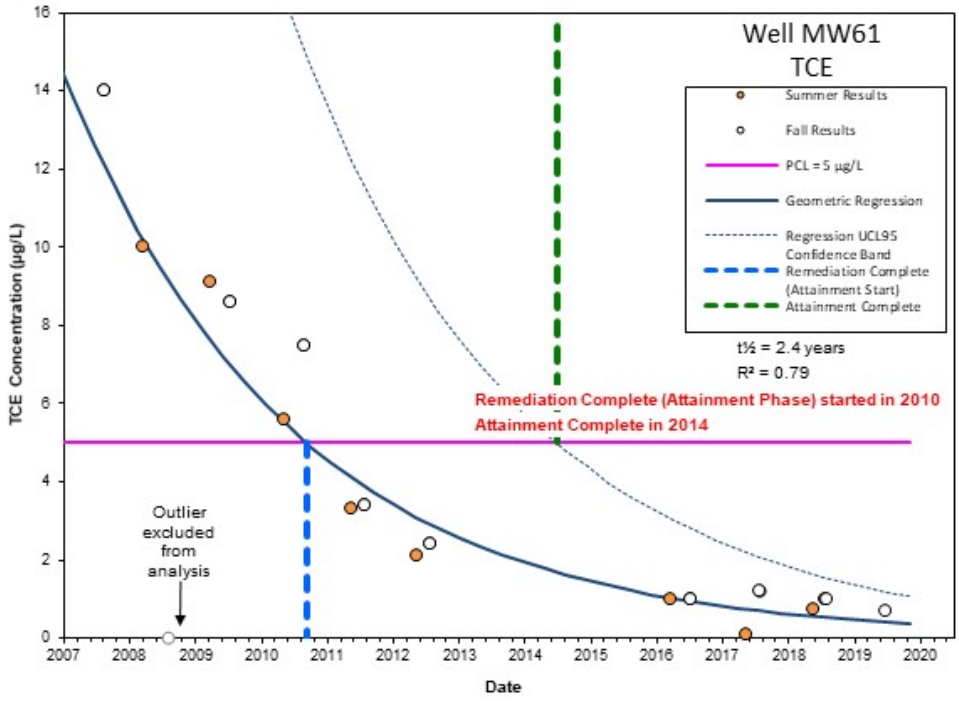
Table 4-7. Cleanup Complete Evaluation for TCE in MW61

Well ID	Trend Result	Number of Data Points[1]	95% UCL	95% UCL Value[2]	Achieve PCL?
MW61	Decreasing	11	2.95	0.86	**Yes**

The analysis is based on the EPA Groundwater Statistics Tool, available from https://www.epa.gov/superfund/superfund-groundwater-groundwater-response-completion
Gray highlight indicates the PCL has been achieved and will continue to achieve at a 95% confidence limit
[1] Number of data points represents the attainment phase
[2] Represents the value of the 95% UCL value at the final sampling event

The Cleanup Complete evaluation was completed using results from the attainment phase, or when TCE concentrations remained below the PCL beginning in 2011. The results show the 95% UCL is less than the PCL, and concentrations continue to decrease. The time-series results from MW61 are reasonably described by a first-order decay regression curve with a half-life of 2.4 years (Graph 4-3). The 95% UCL of the regression curve suggests that remedial goals were met in 2014 at MW61. This indicates that the TCE PCL has been achieved in accordance with EPA requirements (EPA, 2014a). However, the current ADEC CUL for TCE in groundwater is 2.8 µg/L (ADEC, 2018), and further evaluation of the TCE concentrations in groundwater relative to the ADEC CUL is recommended.

Graph 4-3. Geometric Regression of TCE Concentrations in MW61



5.0 CONCLUSIONS AND RECOMMENDATIONS

Historical data have defined five groundwater plumes in the OU6 FCS: The main DRO plume, the MW62 and MW77 DRO plumes, the TCP plume, and the TCE plume. Groundwater monitoring results between 2007 and 2019 were used to conduct an evaluation of the groundwater contaminant plumes in the OU6 FCS. In general, the results showed the contaminant plumes are adequately delineated and are not expanding. The following sections summarize the condition of the OU6 FCS plumes and discuss future groundwater sampling activities.

5.1 DRO Plume Summary

In general, DRO concentrations within the main DRO plume were higher in 2019 than have been measured in recent years, potentially the result of lower groundwater elevations encountered during the 2019 groundwater sampling event. An evaluation of the DRO contaminant trends shows that DRO concentrations at the edges of the main plume are stable; however, concentrations at the center of the plume are increasing. DRO and RRO concentrations in the interior of the plume are expected to persist above the PCL, due to residual NAPL remaining in the soils that continues to be solubilized in the groundwater. Higher concentrations of dissolved manganese and iron, lower concentrations of sulfate, and higher concentrations of methane are evidence that metal and sulfate reduction, as well as methanogenesis, are significant biodegradation processes in the main DRO plume source area. An estimation of the time to cleanup could not be determined for DRO or RRO in monitoring wells associated with the main DRO plume since there were no decreasing trends. When NAPL within the plume is depleted and no longer generates dissolved contaminant concentrations, decreasing trends should become apparent.

The two outlying plumes that are identified by single monitoring wells, MW62 and MW77, appear to represent smaller, lower concentration source areas. The DRO concentration in MW62 has exceeded the PCL only once since 2013. Assuming the DRO remains below the PCL in MW62 in 2020, the cleanup attainment timeframe could be calculated following the EPA guidance (EPA, 2014a). DRO concentrations in MW77, while highly variable, exceeded the PCL in the three 2018/2019 sampling events.

5.2 TCP Plume Summary

TCP concentrations in MW47 and MW79 have consistently (with the exception of the 2011 sampling events of MW47) exceeded the PCL. TCP concentrations in MW47 have a decreasing Mann-Kendall trend while MW79 has no trend. TCP has remained below the PCL in surrounding wells, suggesting minimal plume spread from the source area. Natural attenuation processes are expected to reduce concentrations in downgradient monitoring well MW47, and the 95% UCL is

predicted to be below the PCL in 2038. In contrast, exceedances will likely continue at monitoring well MW79 until the suspected TCP soil source is depleted.

5.3 TCE Plume Summary

TCE concentrations at MW61 have been less than the PCL since 2011, and TCE has never exceeded the PCL in MW80 and has not been detected since 2010. Statistical analysis shows a continued decreasing trend at MW61, and the 95% UCL of the regression curve suggests that remedial goals were met in 2014. This indicates that the TCE PCL has been achieved in accordance with EPA requirements (EPA, 2014a).

Vinyl chloride exceeded the ADEC CUL in the May 2019 sample of MW61. Vinyl chloride, which was not identified as an OU6 COC, has been historically been detected in MW61 above the current ADEC CUL but below the Federal MCL. The 2018 and August 2019 samples collected from MW61 did not detect vinyl chloride; however the LOD exceeded the ADEC CUL for these samples.

5.4 Recommendations

5.4.1 Removal of Monitoring Wells from the Sampling Program

Several reductions in the groundwater sampling program are recommended. Seven wells (MW28, MW32R, MW64, MW35, MW37, MW38, and MW82) are currently being sampled in areas that are cross gradient or downgradient of the DRO plumes. None of the wells have ever had DRO (or RRO) concentrations exceeding the PCL. The crossgradient wells (MW28, MW32R, and MW38) serve little purpose and should be eliminated from the sampling program. Wells MW37, MW64, and MW82 are located downgradient of the DRO plumes and should be retained. MW35 is a redundant downgradient well that should be removed from the sampling program.

Four wells have historically been associated with the TCP plume. Two wells MW47 and MW79 consistently have TCP concentrations exceeding the PCL. MW08 has had a PCP concentration that exceeded the PCL twice (2008 and 2012) and exceeded the ADEC CUL in 2018. The fourth well, MW48, has never had a TCP concentration exceeding the PCL and should be removed from the sampling program.

Four sentry wells are located between the TCP plume and Post water supply wells. The sentry wells are screened at different depths; MW39 is screened across the groundwater table, MW78 is screened below the water table (25-35 bgs), and MW91 and MW93 are screened at deeper depths (50 to 70 feet bgs). MW39 is more crossgradient than downgradient of the TCP plume and should be removed from the sampling program. MW93 is redundant to MW91 and should be removed from the sampling program.

Wells that are removed from the sampling program should be decommissioned in accordance with ADEC requirements.

5.4.2 Vinyl Chloride Analysis of Samples from MW61 and MW80

Since vinyl chloride has been detected above the ADEC CUL in MW61, future sampling of MW61 and MW80 should utilize an analytical method that is capable of achieving the vinyl chloride LOD. Depending upon laboratory capabilities, this may require two separate VOC analyses, the standard (EPA Method 8260C) and a low-level method.

6.0 REFERENCES

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APPENDIX A

GROUNDWATER SAMPLE SUMMARY AND ANALYTICAL RESULTS

Table A-1. Sample Summary
Operable Unit 6
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Depth (feet BTOC)	Sample Type	Matrix	Sampler Initials	Sample Date	Sample Time	VOC 8260C	VOC Low-Level 8260C-SIM	DRO AK102	RRO AK103	Dissolved Fe/Mn 6020A	Sulfate 300.0	Sample Data Group	Cooler ID #
Background															
19FWOU611WG	MW13	18.9	Primary	WG	CB	05/13/19	1705		X			X	X	88915	051501,-02
19FWOU617WG	MW03	18.17	Primary	WG	MD	05/15/19	1015		X			X	X	88941	051601,-03
DRO Plumes															
19FWOU609WG	MW32R	16.9	Primary/MS/MSD*	WG	CB	05/13/19	1530		X	X*	X*	X	X	88915	051501,-02,-03
19FWOU610WG	MW321R	16.9	Field Duplicate of 19FWOU609WG	WG	CB	05/13/19	1545		X			X	X	88915	051502,-03
19FWOU612WG	MW28	19	Primary	WG	CB	05/14/19	1020			X	X	X	X	88941	051601,-02
19FWOU613WG	MW62	16.7	Primary	WG	CB	05/14/19	1200			X	X	X	X	88941	051601,-02
19FWOU614WG	MW33	18.4	Primary/MS/MSD*	WG	CB	05/14/19	1325			X*	X*	X*	X*	88941	051601,-02
19FWOU615WG	MW331	18.4	Field Duplicate of 19FWOU614WG	WG	CB	05/14/19	1340			X	X	X	X	88941	051601,-03
19FWOU616WG	MW12R	14.5	Primary	WG	CB	05/14/19	1500			X	X	X	X	88941	051601,-03
19FWOU619WG	MW37	18.03	Primary	WG	MD	05/14/19	1150			X	X	X	X	88941	051601,-03
19FWOU620WG	MW82	20.02	Primary	WG	MD	05/14/19	1300			X	X	X	X	88941	051601,-03
19FWOU621WG	MW38	17.4	Primary	WG	MD	05/14/19	1450			X	X	X	X	88941	051601,-04
19FWOU622WG	MW77	19.6	Primary	WG	CB	05/15/19	1535			X	X	X	X	88941	051601,-04
19FWOU626WG	MW35	16.7	Primary	WG	MD	05/15/19	1520			X	X	X	X	88941	051604,-05
19FWOU627WG	MW58	15.8	Primary	WG	CB	05/16/19	840			X	X	X	X	88941	051604,-05
19FWOU628WG	MW581	15.8	Field Duplicate of 19FWOU627WG	WG	CB	05/16/19	855			X	X	X	X	88941	051604,-05
19FWOU629WG	MW06A	18.5	Primary	WG	MD	05/16/19	930			X	X	X	X	88941	051605
19FWOU630WG	MW64	17.3	Primary	WG	MD	05/16/19	1030			X	X	X	X	88941	051605
1,2,3-Trichloropropane Plume															
19FWOU601WG	MW47	18.71	Primary/MS/MSD*	WG	MD	05/13/19	1050		X*			X*	X*	88915	051501,-02
19FWOU602WG	MW471	18.71	Field Duplicate of 19FWOU601WG	WG	MD	05/13/19	1105		X			X	X	88915	051501,-02
19FWOU603WG	MW08	20.8	Primary	WG	MD	05/13/19	1340		X			X	X	88915	051501,-02
19FWOU604WG	MW48	18.7	Primary	WG	MD	05/13/19	1505		X			X	X	88915	051501,-02
19FWOU605WG	MW79	20.77	Primary	WG	MD	05/13/19	1645		X			X	X	88915	051501,-02
TCE Plume															
19FWOU623WG	MW61	17.48	Primary/MS/MSD*	WG	MD	05/15/19	1220		X*[2]			X	X	88941	051601
19FWOU624WG	MW611 (MW61)	17.48	Field Duplicate of 19FWOU624WG	WG	MD	05/15/19	1230		X[2]					88941	051601
19FWOU625WG	MW80	41.8	Primary	WG	MD	05/15/19	1345		X[2]			X	X	88941	051601
19FWOU631WG	MW80	41.8	Primary	WG	CB	08/27/19	1100	X						89993	082701
19FWOU632WG	MW61	14.6	Primary/MS/MSD*	WG	CB	08/27/19	1225	X*						89993	082701
19FWOU633WG	MW611 (MW61)	14.6	Field Duplicate of 19FWOU632WG	WG	CB	08/27/19	1240	X						89993	082701

Table A-1. Sample Summary
Operable Unit 6
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Depth (feet BTOC)	Sample Type	Matrix	Sampler Initials	Sample Date	Sample Time	VOC 8260C	VOC Low-Level 8260C-SIM	DRO AK102	RRO AK103	Dissolved Fe/Mn 6020A	Sulfate 300.0	Sample Data Group	Cooler ID #
Sentry Wells															
19FWOU606WG [1]	MW91	66	Primary	WG	CB	05/13/19	1100		X					88915	051501
19FWOU607WG	MW39	19.0	Primary	WG	CB	05/13/19	1220		X					88915	051501
19FWOU608WG	MW78	32	Primary	WG	CB	05/13/19	1400		X					88915	051501
19FWOU618WG	MW93	62.7	Primary	WG	MD	05/14/19	1020		X					88915	051501,-02
Quality Control Samples															
19FWOU6EB01WQ	Rinsate 01	--	Equipment Blank	WQ	CB	05/13/19	1840		X	X	X	X	X	88915	051501,-02,-03
19FWOU6EB02WQ	Rinsate 02	--	Equipment Blank	WQ	CB	05/14/19	1610			X	X	X	X	88941	051601-05
19FWOU6EB03WQ	Rinsate 03	--	Equipment Blank	WQ	CB	05/15/19	1725	X						88941	051601
19FWOU6EB04WQ	Rinsate 04		Equipment Blank	WQ	CB	08/27/19	1300	X						89993	082701
19FWOU6TB01WQ	Trip Blank	--	Trip Blank	WQ	--	05/13/19	800		X					88915	051601
19FWOU6TB02WQ	Trip Blank	--	Trip Blank	WQ	--	05/14/19	800		X					88941	051601
19FWOU6TB03WQ	Trip Blank	--	Trip Blank	WQ	--	08/27/19	800	X						89993	082701

Notes: All samples were submitted to Agriculture & Priority Pollutants Laboratories, Inc (APPL) of Clovis, CA. The standard 21-day turnaround time was requested for all analyses. All work was performed under NPDL work order number 19-077.

* Denotes samples for MS/MSD analysis

[1] All wells were purged and sampled with a submersible pump, with the exception of MW91 (sample 19FWOU606WG). Well MW91 was purged and sampled with a bladder pump due to a partial well obstruction (i.e. the casing is broken below ground surface).

[2] Mid-level 8260C analysis was requested for wells MW61 and MW80 (per the work plan); however, the laboratory analyzed the samples by the low-level 8260C method which resulted in select VOCs not being reported. When the error was realized, the wells were re-sampled for mid-level VOCs. Re-sampling for mid-level VOCs occurred on 8/27/19 (samples 19FWOU631WG, 19FWOU632WG, and 19FWOU633WG associated with report 89993).

BTOC - below top of casing
°C - degrees Celsius
CB - Chris Boese
DRO - diesel range organics
HCl - hydrochloric acid
HDPE - high-density polyethylene
HNO_3 - nitric acid
MD - Mikayla Daigle
mL - milliliters
MS/MSD - matrix spike/matrix spike duplicate
RRO - residual range organics
VOA - volatile organic analysis
VOC - volatile organic compounds
WG - groundwater matrix
WQ - water quality control

Water Sample Collection (all samples were field-preserved at 0 to 6°C)
VOC - three HCl-preserved, 40 mL VOA vials
VOC Low-Level - three HCl-preserved, 40 mL VOA vials
DRO/RRO - two HCl-preserved, 250 mL amber bottles
Dissolved Fe/Mn - one HNO_3-preserved, 125 mL HDPE bottle (field filtered)
Sulfate - one non-preserved, 500 mL HDPE bottle

Table A-2. Groundwater Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	19FWOU601WG	19FWOU602WG	19FWOU603WG	19FWOU604WG	19FWOU605WG	19FWOU606WG	19FWOU607WG	19FWOU608WG	19FWOU609WG	19FWOU610WG	19FWOU611WG	19FWOU612WG	19FWOU613WG	19FWOU614WG
			Location ID	MW47	MW471	MW08	MW48	MW79	MW91	MW39	MW78	MW32R	MW321R	MW13	MW28	MW62	MW33
			Sample Data Group	88915	88915	88915	88915	88915	88915	88915	88915	88915	88915	88915	88941	88941	88941
			Laboratory ID	AZ91409	AZ91410	AZ91411	AZ91412	AZ91413	AZ91414	AZ91415	AZ91416	AZ91417	AZ91418	AZ91419	AZ91492	AZ91493	AZ91494
			Collection Date	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/13/2019	5/14/2019	5/14/2019	5/14/2019
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primay/MS/MSD	Field Duplicate of 19FWOU602WG	Primary	Primary	Primary	Primary	Primary	Primary	Primay/MS/MSD	Field Duplicate of 19FWOU609WG	Primary	Primany	Primany	Primany/MS/MSD
Analyte	**Method**	**Units**	**OU6 ROD RG / ADEC CUL [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Iron	SW6020	µg/L	NE	48.3 [30.0] J	35.3 [30.0] J	14.6 [30.0] J	1330 [30.0]	10600 [30.0]	-	-	-	433 [30.0]	-	1860 [30.0]	39.3 [30.0] J, B	127 [30.0] B	43400 [300]
Manganese	SW6020	µg/L	430	148 [0.80]	146 [0.80]	14.1 [0.80]	**866 [0.80]**	**793 [0.80]**	-	-	-	359 [0.80]	-	**774 [0.80]**	**961 [4.00]**	**1430 [4.00]**	**2880 [8.00]**
Sulfate	E300.0	mg/L	NE	32.6 [0.990]	36.7 [0.198]	40 [0.198]	48.9 [0.198]	29.2 [0.198]	-	-	-	49.4 [0.990]	-	41.1 [0.198]	47.1 [0.990]	79.5 [0.990]	4.5 [0.198]
Diesel Range Organics	AK102	µg/L	1,500 / 1,500	-	-	-	-	-	-	-	-	540 [50] J	820 [50] J	-	790 [50] B	420 [50] B	**69000 [5000] J**
Residual Range Organics	AK103	µg/L	1,100 / 1,100	-	-	-	-	-	-	-	-	250 [200] J, J+	300 [200] J, J+	-	230 [200] J,B	310 [200] J,B	ND [20000]
1,2,3-Trichloropropane	8260C-SIM	µg/L	0.12 / 0.0075	**0.3 [0.0050]**	**0.31 [0.0050]**	ND [0.0050]	ND [0.0050]	**0.29 [0.0050]**	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	-	ND [0.0050]	-	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	0.058 [0.015]	-	ND [0.015]	-	-	-
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	SW8260C	µg/L	0.12 / 0.0075	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (TCE)	SW8260C	µg/L	5.0 / 2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Results in green and bold font exceed ADEC CULs.
Results in red and bold font exceed both ROD RGs and ADEC CULs.
Grey shaded results are non-detect with LODs above OU6 ROD RGs and/or ADEC CULs.

[1] **OU6 ROD analytes and RGs are identified in blue text.** The remaining values are ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of October 27, 2018).

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Acronyms:
CUL - cleanup level
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
RG - remedial goal
ROD - Record of Decision
WG - groundwater
WQ - water QC sample

Table A-2. Groundwater Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	19FWOU615WG	19FWOU616WG	19FWOU617WG	19FWOU618WG	19FWOU619WG	19FWOU620WG	19FWOU621WG	19FWOU622WG	19FWOU623WG	19FWOU624WG	19FWOU625WG	19FWOU626WG	19FWOU627WG	19FWOU628WG
			Location ID	MW331	MW12R	MW03	MW93	MW37	MW82	MW38	MW77	MW61	MW611	MW80	MW35	MW58	MW581
			Sample Data Group	88941	88941	88941	88915	88941	88941	88941	88941	88941	88941	88941	88941	88941	88941
			Laboratory ID	AZ91495	AZ91496	AZ91497	AZ91420	AZ91498	AZ91499	AZ91500	AZ91501	AZ91502	AZ91503	AZ91504	AZ91507	AZ91508	AZ91509
			Collection Date	5/14/2019	5/14/2019	5/15/2019	5/13/2019	5/14/2019		5/14/2019	5/15/2019	5/15/2019	5/15/2019	5/15/2019	5/15/2019	5/16/2019	5/16/2019
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Field Duplicate of 19FWOU614WG	Primany	Primany	Primary	Primany	Primany	Primany	Primany	Primany/MS/MSD	Field Duplicate of 19FWOU623WG	Primany	Primany	Primany	Field Duplicate of 19FWOU627WG
Analyte	**Method**	**Units**	**OU6 ROD RG / ADEC CUL [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Iron	SW6020	µg/L	NE	45000 [300]	9900 [30.0]	12700 [30.0]	ND [30.0]	74.4 [30.0] B	24.4 [30.0] J, B	11500 [30.0]	76.7 [30.0] B	10500 [30.0]	-	10600 [30.0]	88.6 [30.0] B	17500 [30.0]	17400 [30.0]
Manganese	SW6020	µg/L	430	**3060 [8.00]**	**906 [0.80]**	**745 [0.80]**	2 [0.80] J	**1110 [4.00]**	265 [0.80]	**1270 [4.00]**	**956 [0.80]**	**1440 [4.00]**	-	**812 [0.80]**	294 [0.80]	**1100 [4.00]**	**1060 [4.0]**
Sulfate	E300.0	mg/L	NE	4.1 [0.198]	35.4 [0.198]	50.7 [0.198]	ND [0.198]	27.9 [0.198]	13.7 [0.198]	39.5 [0.198]	55.7 [0.990]	40.2 [0.990]	-	31.8 [0.198]	39.7 [0.198]	15.8 [0.198]	15.7 [0.198]
Diesel Range Organics	AK102	µg/L	1,500 / 1,500	**95000 [5000] J**	330 [50] B	300 [50] B	-	1400 [50]	210 [50] B	460 [50] B	**7800 [500]**	-	-	-	410 [50] B	**4500 [50]**	**4500 [50]**
Residual Range Organics	AK103	µg/L	1,100 / 1,100	ND [20000]	160 [200] J,J+,B	180 [200] J,B	-	210 [200] J, B	130 [200] J,B	250 [200] J, B	ND [2000]	-	-	-	220 [200] J,B	320 [200] J,B	530 [200] J,J+,B
1,2,3-Trichloropropane	8260C-SIM	µg/L	0.12 / 0.0075	-	-	-	ND [0.0050]	-	-	-	-	ND [0.0050]	ND [0.0050]	ND [0.0050]	-	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	-	-	-	ND [0.015]	-	-	-	-	**0.42 [0.015]**	**0.4 [0.015]**	ND [0.015]	-	-	-
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	SW8260C	µg/L	0.12 / 0.0075	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (TCE)	SW8260C	µg/L	5.0 / 2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Table A-2. Groundwater Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	19FWOU629WG	19FWOU630WG	19FWOU631WG	19FWOU632WG	19FWOU633WG	19FWOU6EB01WQ	19FWOU6TB01WQ	19FWOU6EB02WQ	19FWOU6EB03WQ	19FWOU6TB02WQ	19FWOU6EB04WQ	19FWOU6TB03WQ
			Location ID	MW06A	MW64	MW80	MW61	MW611	RINSATE 1	TRIP BLANK	RINSATE 2	RINSATE 3	TRIP BLANK	Rinsate 4	Trip Blank
			Sample Data Group	88941	88941	89993	89993	89993	88915	88915	88941	88941	88941	89993	89993
			Laboratory ID	AZ91510	AZ91511	AZ91493	AZ91494	AZ91495	AZ91421	AZ91422	AZ91512	AZ91505	AZ91506	AZ91505	AZ91506
			Collection Date	5/16/2019	5/16/2019	8/27/2019	8/27/2019	8/27/2019	5/13/2019	5/13/2019	5/14/2019	5/15/2019	5/14/2019	8/27/2019	8/27/2019
			Matrix	WG	WG	WG	WG	WG	WQ	WQ	WQ	WQ	WQ	WQ	WQ
			Sample Type	Primany	Primany	Primany	Primany/MS/MSD	Field Duplicate of 19FWOU632WG	Equipment Blank	Trip Blank	Equipment Blank	Equipment Blank	Trip Blank	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**OU6 ROD RG / ADEC CUL [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Iron	SW6020	µg/L	NE	19500 [150]	2920 [30.0]	-	-	-	-	-	75.7 [30.0]	-	-	-	-
Manganese	SW6020	µg/L	430	**1180 [4.00]**	423 [0.80]	-	-	-	-	-	5.6 [0.80]	-	-	-	-
Sulfate	E300.0	mg/L	NE	12.5 [0.198]	9.4 [0.198]	-	-	-	-	-	ND [0.198]	-	-	-	-
Diesel Range Organics	AK102	µg/L	**1,500** / 1,500	**18000 [1000]**	ND [50]	-	-	-	ND [50]	-	170 [50]	-	-	-	-
Residual Range Organics	AK103	µg/L	**1,100** / 1,100	ND [4000]	ND [200]	-	-	-	ND [200]	-	130 [200] J	-	-	-	-
1,2,3-Trichloropropane	8260C-SIM	µg/L	**0.12** / 0.0075	-	-	-	-	-	ND [0.0050]	ND [0.0050]	-	ND [0.0050]	ND [0.0050]	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	-	-	-	-	-	ND [0.015]	ND [0.015]	-	ND [0.015]	ND [0.015]	-	-
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	ND [0.50]	ND [0.50]	ND [0.50]	-	-	-	-	-	ND [0.50]	ND [0.50]
1,2,3-Trichloropropane	SW8260C	µg/L	**0.12** / 0.0075	-	-	ND [1.00]	ND [1.00]	ND [1.00]	-	-	-	-	-	ND [1.00]	ND [1.00]
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	ND [0.30]	6.1 [0.30] J+	6.9 [0.30] J+	-	-	-	-	-	ND [0.30]	ND [0.30]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	ND [0.30]	ND [0.30]	ND [0.30]	-	-	-	-	-	ND [0.30]	ND [0.30]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	ND [0.30]	6.5 [0.30] J+	7.0 [0.30] J+	-	-	-	-	-	ND [0.30]	ND [0.30]
Trichloroethene (TCE)	SW8260C	µg/L	**5.0** / 2.8	-	-	ND [0.30]	ND [0.30]	0.67 [0.30] J, J+	-	-	-	-	-	ND [0.30]	ND [0.30]
Vinyl chloride	SW8260C	µg/L	0.19	-	-	ND [0.30]	ND [0.30]	ND [0.30]	-	-	-	-	-	ND [0.30]	ND [0.30]

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RG - remedial goal
ROD - Record of Decision
WG - groundwater
WQ - water QC sample

APPENDIX B

CHEMICAL DATA QUALITY REVIEW AND ADEC CHECKLISTS

FINAL

CHEMICAL DATA QUALITY REVIEW

Operable Unit 6 (2019)

Fort Wainwright, Alaska

NPDL # 19-077

Prepared: November 4, 2019

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 Postwide Uniform Federal Policy for Quality Assurance Project Plans.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
B	analytical result is qualified as a potential high estimate due to contamination present in a blank sample
°C	degree Celsius
CCV	continuing calibration verification
CDQR	Chemical Data Quality Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain-of-custody
CUL	cleanup level
%D	percent difference
DCE	dichloroethene
DL	detection limit
DoD	Department of Defense
DQO	data quality objective
DRO	diesel range organics
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
Fe	iron
FES	Fairbanks Environmental Services, Inc.
ICV	initial calibration verification
J	analytical result is qualified as an estimated value due to its quantitation level (≥DL and <LOQ), or it may signify that there is a QC deviation and the bias is unknown
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
Mn	manganese
MS	matrix spike sample
MSD	matrix spike duplicate sample
NA	not applicable
ND	non-detect
OU6	Operable Unit 6

PCE	tetrachloroethene
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories
R	analytical result is rejected and is not suitable for project use
RG	remedial goal
RPD	relative percent difference
ROD	Record of Decision
RRO	residual range organics
SDG	sample data group
SIM	selective ion monitoring
TCE	trichloroethene
TCP	trichloropropane
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plans
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION

This Chemical Data Quality Review (CDQR) summarizes the technical review of analytical results generated in support of groundwater sample collection by Fairbanks Environmental Services, Inc. (FES) at the Operable Unit 6 (OU6) Former Communications Site during 2019. The groundwater sampling events are summarized in Section 1.3. Sample summary and analytical results tables are presented in Appendix A.

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 2019 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan (FES, 2019); Final Postwide Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP; FES, 2016); Alaska Department of Environmental Conservation (ADEC) Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data Technical Memo (ADEC, 2019a); and Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.1 (DoD, 2017). The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess contamination), project sample and laboratory QC 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 (CCV) 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 results and limits of detection (LODs) for non-detect results were compared to OU6 Record of Decision (ROD) remedial goals (RGs), or ADEC cleanup levels (CULs) presented in Title 18 of the Alaska Administrative Code (AAC) Chapter 75.345, Table C (ADEC, 2018), as appropriate.

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 Postwide 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	LOD (µg/L)	Accuracy (%)	Precision (RPD, %)	Completeness (%)
Trichloroethene (TCE) [1]	SW5030B	SW8260C	0.30	79-123	20	90
1,2,3-Trichloropropane (TCP) [1]	SW5030B	SW8260C-SIM	0.0050	73-122	20	90
Diesel Range Organics (DRO)	SW3520C	AK102	50	75-125	20	90
Residual Range Organics (RRO)	SW3520C	AK103	200	60-120	20	90
Dissolved Iron (Fe) & Manganese (Mn)	SW3010A	SW6010C	30.0 (Fe) 3.5 (Mn)	87-118 (Fe) 87-115 (Mn)	20	90
Sulfate	E300.0		198	87-112	15	90

[1] Additional volatile organic compounds (VOCs) were analyzed by mid-level (8260C) and low-level (8260C-SIM) analyses, but only OU6 ROD analytes and natural attenuation parameters are shown. Limits for other VOCs are presented in the Work Plan (FES, 2019), associated laboratory reports, and results Table A-2 in Appendix A.
µg/L – micrograms per liter
RPD – relative percent difference
SIM – selective ion monitoring

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) 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 ROD RGs and/or ADEC CULs.
- *Completeness* describes the amount of valid data obtained from the sampling event(s). It is calculated as the percentage of valid measurements compared to the total number of measurements. The completeness goal for this project was set at 90 percent.

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

1.2 Data Qualifiers

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

Table B-2. Data Qualifier Definitions

Qualifier	Definition
ND	The analyte was analyzed for, but not detected.
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 33 groundwater samples (including 6 field duplicates) were collected from monitoring wells at OU6. Extra volume was collected for MS/MSD samples for every analysis and sample data group (SDG), meeting the minimum required frequency of 1 per 20 samples. Four equipment blank samples were collected during the sampling events to assess the potential for cross-contamination of the submersible pump. In addition, one trip blank sample accompanied each cooler containing samples for volatile analyses. Samples were analyzed by one or more of the analytical methods presented in Table B-1.

All project and quality control samples were analyzed by Agriculture & Priority Pollutants Laboratories, Inc. (APPL) of Clovis, CA. The laboratory is approved by the State of Alaska through the Contaminated Sites Program for applicable methods employed for this project, with the exception

of sulfate by Environmental Protection Agency (EPA) Method 300.0 (method 300.0 is not listed as a Contaminated Sites analysis). The laboratory is also certified through the Environmental Laboratory Accreditation Program (ELAP) for all methods employed for this project.

All groundwater samples were shipped in three SDGs and assigned the APPL report numbers 88915, 88941, and 89993. A sample summary table (Table A-1) and analytical results table (Table A-2) are included in Appendix A. 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. Groundwater samples were analyzed by APPL and are included in three SDGs, as discussed in Section 1.3. See the associated ADEC Laboratory Data Review Checklists at the end of Appendix B for more elaborate data quality descriptions.

2.1 Sample Collection

All monitoring wells were purged and sampled with submersible pumps employing Teflon-lined pump tubing, with the exception of one well noted in the first bullet below. In addition, four equipment blank samples were collected from decontaminated submersible pumps to assess potential sampling cross-contamination. Equipment blank results are further discussed in Section 2.3.

Groundwater sampling activities were recorded on the groundwater sample forms provided in Appendix C. Groundwater sample forms were reviewed to ensure that well drawdown and groundwater parameters met the stabilization criteria identified in the ADEC Field Sampling Guidance (ADEC, 2019b) and the UFP-QAPP (FES, 2016), that low-flow sampling criteria was employed (Puls and Barcelona, 1996), and that all groundwater levels were within the screened intervals at the time of sampling, as appropriate. All samples met stabilization criteria and all water levels were within the screened interval during sample collection, with the exception of those noted below. Also summarized below are any notable issues/observations discovered during groundwater sampling activities or during review of the groundwater sample forms.

- All wells were sampled with a submersible pump except well MW91 (sample 19FWOU606WG). This well was purged and sampled using a bladder pump with new, disposable pump bladder and tubing due to a partial well obstruction.
- Free product was measured in well MW77 (0.03 feet) prior to purging. Due to the presence of free product, groundwater was not pumped through a flow-through cell and parameters were not collected. However, a laboratory sample (19FWOU622WG) was collected after the removal of three casing volumes. Although stabilization of parameters cannot be verified, sample quality is presumed adequate since purging of three casing volumes using low-flow sampling criteria was conducted prior to sample collection. Care was taken to keep the pump intake approximately one foot below the free product so product would not be introduced into the sample containers.
- Sheen was observed on purge water from well MW33. Petroleum odor was noted during purging of wells MW33 (strong odor), MW93 (slight odor), and MW06A during the sampling event. In addition, black staining was observed on the dedicated pump tubing in well MW33.
- All wells were found screened across the water table during purging and sampling activities, with a few exceptions. Two sentry wells, MW78 and MW80, were screened below the water

table to monitor potential diving of the contaminant plume towards the pump intake of the nearby Water Supply Well (Building 3559). Monitoring well MW80, located within the trichloroethene (TCE) plume area, was also screened below the water table to evaluate the vertical extent of contamination. Groundwater samples from these wells were collected from within the well screen in order to obtain a representative sample of the aquifer at depth.

2.2 Sample Handling

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

Sample Login Discrepancies

- (88915) The laboratory inadvertently did not login the dissolved iron/manganese and sulfate samples for equipment blank sample 19FWOU6EB01WQ; therefore, the samples were not analyzed. By the time the error was realized, the holding time for the samples had been exceeded. Impact to the project is negligible as the analytes are not site contaminants of concern.
- (88941) Low-level VOC analysis was not requested on the COC but was performed for samples 19FWOU623WG, 19FWOU624WG, and 19FWOU625WG. The project is set up with the laboratory to run specific analytes by mid-level 8260C (1,1-dichloroethene [DCE]; 1,2,3-trichloropropane [TCP]; cis-1,2-DCE; trans-1,2-DCE; tetrachloroethene [PCE]; TCE; and vinyl chloride) and a smaller sub-set by low-level 8260C-selective iron monitoring (SIM) (1,2,3-TCP and vinyl chloride). Consequently, since the low-level method was performed, several required analytes were not reported for these samples. This impacts the data for wells MW61 (primary and field duplicate) and MW80. As a corrective action, the wells were later re-sampled for mid-level 8260C and the results are reported in APPL report 89993.

Sample Headspace Discrepancies

- (89993) One of three volatile organic compound (VOC) volatile organic analysis (VOA) vials for sample 19FWOU632WG was reported to have an air bubble "smaller than a pea" and one of three VOA vials for trip blank sample 19FWOU6TB03WQ was reported to have an air bubble "larger than a pea". VOC analysis was performed on VOAs without headspace, so no data were impacted.

Holding Time Discrepancies

- (88915) The initial VOC analytical run was performed within holding time. However; all VOC samples were re-analyzed 2 to 3 days outside the 14-day holding time due to an initial calibration verification (ICV) failure for vinyl chloride in the initial run (further discussed in

Section 2.8). The results from the re-analysis confirmed the results of the initial analysis, so the results from the initial analysis are reported as primary. No data were qualified.

- (88941) The initial VOC analytical run was performed within holding time. However; all VOC samples were re-analyzed 1 to 2 days outside the 14-day holding time due to an ICV failure for vinyl chloride in the initial run (further discussed in Section 2.8). The results from the re-analysis confirmed the results of the initial analysis, so the results from the initial analysis are reported as primary. No data were qualified.
- (89993) The VOC samples were analyzed a few hours outside of the 14-day holding time window. However, since the analysis occurred within the 14th day, no data were qualified.

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, as required. No method blank contamination resulted in data qualification. See the ADEC Checklists for additional details.

Trip Blanks

Trip blank samples were shipped in every cooler containing samples for volatile analyses. No trip blank contamination was noted.

Equipment Blanks

Four equipment blank samples were collected to evaluate the potential for submersible pump cross-contamination. The results of these equipment blank samples were compared against results of associated project samples. All samples are associated with an equipment blank except sample 19FWOU606WG collected from well MW91. This well was purged and sampled with a bladder pump due to a partial well obstruction (see Section 2.1). Analytes that were detected in equipment blank samples that resulted in data qualification are discussed below.

The analytes listed on the following page were detected in equipment blank samples and were also detected in associated project samples within five-times the concentration detected in the equipment blank. Consequently, these analytical results were qualified (B) as potential submersible pump cross-contamination. In all cases, impact to data quality was negligible as the affected results were either not a site contaminant (i.e. dissolved iron) or were approximately two orders of magnitude less than the ROD RG. Equipment blank contamination that did not result in data qualification is further discussed in associated ADEC Laboratory Data Review Checklists.

(88941) Equipment blank 19FWOU6EB02WQ

- Dissolved Iron: 19FWOU612WG, 19FWOU613WG, 19FWOU619WG, 19FWOU620WG, 19FWOU622WG, and 19FWOU626WG
- Diesel range organics (DRO): 19FWOU612WG, 19FWOU613WG, 19FWOU616WG, 19FWOU617WG, 19FWOU620WG, 19FWOU621WG, and 19FWOU626WG
- Residual range organics (RRO): 19FWOU612WG, 19FWOU613WG, 19FWOU616WG, 19FWOU617WG, 19FWOU619WG, 19FWOU620WG, 19FWOU621WG, 19FWOU626WG, and 19FWOU627WG, and 19FWOU628WG

2.4 Laboratory Control Samples

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

All LCS and/or LCSD samples were performed, as required. The accuracy of analyte recoveries for LCS samples, and precision of the LCS/LCSD sample pair (when applicable), was evaluated. The LCS/LCSD recovery and/or RPD exceedances that resulted in data qualification are summarized below. See the associated ADEC Laboratory Data Review Checklists for more elaborate details.

- (88915) The RRO LCS/LCSD from batch 240939 exceeded the upper control limit (126%/130% vs 120%). RRO was detected in field duplicate samples 19FWOU609WG/19FWOU610WG and the results were qualified as estimates with a high bias (J+) due to the high recoveries. Impact to the project is negligible as the affected data are an order of magnitude less than the ROD RG and the results are consistent with historic data for this well (MW32R).

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 for every QC batch, at the minimum frequency of 1 for every 20 samples, to evaluate recovery accuracy. In addition, precision of each QC batch must be evaluated by performing either a MSD sample analysis or a sample duplicate analysis and calculating the RPD.

All MS/MSD samples were performed, as required, except in the extraction batches noted on the following page. Although potential matrix interference could not be evaluated, batch accuracy and precision was evaluated through LCS/LCSD, laboratory duplicates, and/or MS/MSD analysis on another client's sample. More detail is provided on a case-by-case basis in the associated ADEC Laboratory Data Review Checklists.

- VOC: 244602 (89993); and confirmation batch 240925 (88915 and 88941)
- Sulfate: 241232 (88915); 241229 (88941)

The accuracy of the analyte recoveries, and the precision of the MS/MSD or laboratory duplicate pairs, was evaluated (when analyzed). The accuracy of analyte recoveries for MS samples, and precision of the MS/MSD sample pair (when applicable), was evaluated. No MS/MSD recovery and/or RPD exceedances resulted in data qualification. See the associated ADEC Laboratory Data Review Checklists for more elaborate details.

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. Surrogate recovery discrepancies that resulted in data qualification are listed below. See the associated ADEC Laboratory Data Review Checklists for more elaborate details.

- (88941) The RRO surrogate n-octacosane recovery exceeded the upper control limit (153%/163% vs 150%) for samples 19FWOU616WG and 19FWOU628WG. The detected RRO results in these samples were qualified as estimates with a high bias (J+) due to the high surrogate recoveries. Impact to the project was negligible as the affected results are potentially high-biased and are an order of magnitude less than the ROD RG.
- (89993) VOC sample 19FWOU632WG had surrogate recoveries that exceeded the upper control limit: 4-bromofluorobenzene (127% vs 114%) and toluene-d8 (132% vs 112%). The detected VOC results (cis- and trans-1,2-DCE) in this sample were qualified as estimates with a high bias (J+) due to the high recoveries. Impact to the project was negligible as the affected data were a minimum of six times greater than the ADEC CULs.
- (89993) Sample 19FWOU633WG had surrogate recoveries that exceeded the upper control limit: 1,2-dichloroethane-d4 (122% vs 118%) and dibromofluoromethane (121% vs 119%). The detected VOC results (cis- and -trans-1,2-DCE and TCE) in this sample were qualified as estimates with a high bias (J+) due to the high recoveries. Impact to the project was negligible as the affected data were a minimum of six times greater than the ROD RG and/or ADEC CULs.

2.7 Field Duplicates

Six field duplicate samples were collected and submitted to the laboratory as blind samples with 27 project samples. Field duplicates were collected at a minimum frequency of 10 percent for each analytical method and SDG, which meets the requirement of the UFP-QAPP.

Field duplicate results are summarized in Table B-3. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the LOD value followed by the "U" qualifier. If both results of the field duplicate pair were less than

the limit of quantitation (LOQ) (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the UFP-QAPP. All (applicable) field duplicate sample results are within the ADEC criterion of ≤30% and, therefore, are considered comparable with the exceptions discussed below. Affected analytes are identified in grey shading in Table B-3 and results for the associated field duplicate sample pairs were qualified as estimates (J) due to imprecision in results tables associated with this report.

- (88915) All (applicable) results for field duplicate sample pair 19FWOU601WG/19FWOU602WG were comparable (RPD ≤ 30%) with the exception of dissolved iron (31%). Impact to the project was negligible as the RPD exceedance was marginal (1% high).
- (88915) All (applicable) results for field duplicate sample pair 19FWOU609WG/19FWOU610WG were comparable (RPD ≤ 30%) with the exception of DRO (41%). Although DRO is a ROD analyte, impact to the project is negligible as the affected results are approximately one order of magnitude less than the ROD RG and the results are within the typical concentration range observed for this crossgradient well (AP-MW32R).
- (88941) All (applicable) results for field duplicate sample pair 19FWOU614WG/19FWOU615WG were comparable (RPD ≤ 30%) with the exception of DRO (32%). Impact to the project is negligible as the RPD exceedance was marginal (2% high). This well (MW33) consistently has DRO at concentrations exceeding the ROD RG by more than an order of magnitude.
- (88941) All (applicable) results for field duplicate sample pair 19FWOU627WG/19FWOU628WG were comparable (RPD ≤ 30%) with the exception of RRO (49%). Precision may have been impacted by submersible pump cross-contamination as suggested by a similar result in the equipment blank sample (see Section 2.3). Overall the impact to the project due to the imprecision is negligible as the affected results are less than the ROD RG and the results are consistent with the concentration range observed in this well (MW06A).

Table B-3. Groundwater Field Duplicate Sample Results Evaluation

Analyte	Method	Units	Primary[1] 19FWOU601WG (MW47)	Field Duplicate[1] 19FWOU602WG (MW471)	RPD, %	Comparable Criteria Met?[4]
1,2,3-Trichloropropane	8260C-SIM	µg/L	0.30	0.31	3	Yes
Vinyl chloride	8260C-SIM	µg/L	0.015U	0.015U	0	Not applicable
Dissolved Iron	6020A	µg/L	48.3	35.3J	31	No
Dissolved Manganese	6020A	µg/L	148	146	1	Yes
Sulfate	300.0	mg/L	32.6	36.7	12	Yes
Analyte	**Method**	**Units**	**Primary[1] 19FWOU609WG (MW32R)**	**Field Duplicate[1] 19FWOU610WG (MW321R)**	**RPD, %**	**Comparable Criteria Met?[4]**
DRO	AK102	mg/L	0.54	0.82	41	No
RRO	AK103	mg/L	0.25J	0.30J	18	Not applicable

Table B-3 Cont'd. Groundwater Field Duplicate Sample Results Evaluation

Analyte	Method	Units	Primary[2] 19FWOU614WG (MW33)	Field Duplicate[2] 19FWOU615WG (MW331)	RPD, %	Comparable Criteria Met? [4]
DRO	AK102	mg/L	69	95	32	No
RRO	AK103	mg/L	20.00U	20.00U	0	Not applicable
Dissolved Iron	6020A	µg/L	43400	45000	4	Yes
Dissolved Manganese	6020A	µg/L	2880	3060	6	Yes
Sulfate	300.0	mg/L	4.5	4.1	9	Yes
Analyte	**Method**	**Units**	**Primary[2] 19FWOU623WG (MW61)**	**Field Duplicate[2] 19FWOU624WG (MW611)**	**RPD, %**	**Comparable Criteria Met? [4]**
1,2,3-Trichloropropane	8260C	µg/L	0.0050U	0.0050U	0	Not applicable
Vinyl chloride	8260C	µg/L	0.42	0.40	5	Yes
Analyte	**Method**	**Units**	**Primary[2] 19FWOU627WG (MW58)**	**Field Duplicate[2] 19FWOU628WG (MW581)**	**RPD, %**	**Comparable Criteria Met? [4]**
DRO	AK102	mg/L	4.5	4.5	0	Yes
RRO	AK103	mg/L	0.32J	0.53	49	No
Dissolved Iron	6020A	µg/L	17500	17400	1	Yes
Dissolved Manganese	6020A	µg/L	1100	1060	4	Yes
Sulfate	300.0	mg/L	15.8	15.7	1	Yes
Analyte	**Method**	**Units**	**Primary[3] 19FWOU632WG (MW61)**	**Field Duplicate[3] 19FWOU633WG (MW611)**	**RPD, %**	**Comparable Criteria Met?[4]**
1,1-Dichloroethene	8260C	µg/L	0.50U	0.50U	0	Not applicable
1,2,3-Trichloropropane	8260C	µg/L	1.00U	1.00U	0	Not applicable
cis-1,2-Dichloroethene	8260C	µg/L	6.1	6.9	12	Yes
Tetrachloroethene	8260C	µg/L	0.30U	0.30U	0	Not applicable
trans-1,2-dichloroethene	8260C	µg/L	6.5	7.0	7	Yes
Trichloroethene	8260C	µg/L	0.30U	0.67J	76	Not applicable
Vinyl chloride	8260C	µg/L	0.30U	0.30U	0	Not applicable

The LODs are presented for non-detect results and were used for RPD calculations.
[1] – The samples are associated with report 88915
[2] – The samples are associated with report 88941
[3] – The samples are associated with report 89993
[4] – RPD of ≤30 percent was used for evaluating water-matrix field duplicate samples.
J – Result is estimated since it is reported below the LOQ, or it is qualified due to imprecision
mg/L – milligrams per liter
RPD – relative percent difference
U – non-detect results

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, ICV samples, CCV samples, and internal standards.

The QC discrepancies noted by the laboratory are listed below; however, no discrepancy resulted in data qualification.

- (88915 and 88941) The VOC ICV from 5/24/19, standard 0524M23, had a percent difference (%D) reported above the control limit for vinyl chloride (24% vs. <20.0%). All VOC samples were re-analyzed 2 to 3 days (88915) or 1 to 2 (88941) outside of hold time (as discussed in Section 2.2) with no analytical discrepancies. The results of the second analytical run confirmed the results of the initial run. Since the results were confirmed and the initial batch was conducted within hold time, the initial results are reported as primary and no data were qualified.
- (89993) The VOC ICV from 9/10/19, standard 0909T44, had a %D reported above the control limit for vinyl chloride (23% vs. <20.0%). All VOC samples were associated and were non-detect for vinyl chloride. Since the ICV failed high and the associated results were non-detect, no sample qualification was necessary.

2.9 Analytical Sensitivity

Several project data analytes were reported above the detection limit (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 OU6 ROD RG and ADEC CUL, 18 AAC 75.345, Table C (ADEC, 2018) for non-detect results. Non-detect analytes with LODs above the applicable action level are listed below and are also identified in grey shading in Table A-2 in Appendix A.

- (88941) RRO results in samples 19FWOU614WG (primary/MS/MSD), 19FWOU615WG, 19FWOU622WG, and 19FWOU629WG did not meet the ROD RG due to sample dilution (100x, 100x, 10x, and 20x, respectively). The samples were diluted because the extracts were highly colored and viscous (DRO concentrations were approximately an order of magnitude or more above the ROD RG). Impact to the project is negligible as the affected wells (MW33 and MW06A) are within a DRO plume and RRO in these wells is typically an order of magnitude below the RG.
- (89993) Vinyl chloride and 1,2,3-TCP in samples 19FWOU631WG through 19FWOU633WG, equipment blank 19FWOU6EB04WQ, and trip blank 19FWOU6TB03WG did not meet the applicable action level for the mid-level 8260C method. These analytes may not be detected, if present, at the respective action level. However, the analytical limitations for these analytes by this method were presented in the approved Work Plan. Note that these compounds are analyzed by the low-level 8260C method in select OU6 wells where a lower DL is desired, as detailed in the 2019 CERCLA Sites Work Plan (FES, 2019).

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 summarizes the qualified groundwater results associated with the sampling events at the OU6 site, 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
88915	19FWOU609WG, 19FWOU610WG	RRO	J+	High LCS/LCSD recovery
	19FWOU601WG, 19FWOU602WG	Dissolved Iron	J	Field duplicate imprecision
	19FWOU609WG, 19FWOU610WG	DRO		
88941	19FWOU612WG, 19FWOU613WG, 19FWOU619WG, 19FWOU620WG, 19FWOU622WG, 19FWOU626WG	Dissolved Iron	B	Equipment blank contamination
	19FWOU612WG, 19FWOU613WG, 19FWOU616WG, 19FWOU617WG, 19FWOU620WG, 19FWOU621WG, 19FWOU626WG	DRO		
	19FWOU612WG, 19FWOU613WG, 19FWOU616WG, 19FWOU617WG, 19FWOU619WG, 19FWOU620WG, 19FWOU621WG, 19FWOU626WG, 19FWOU627WG, 19FWOU628WG	RRO		
	19FWOU616WG, 19FWOU628WG	RRO	J+	High surrogate recovery
	19FWOU614WG, 19FWOU615WG	DRO	J	Field duplicate imprecision
	19FWOU627WG, 19FWOU628WG	RRO		
89993	19FWOU632WG	cis-1,2-DCE trans-1,2-DCE	J+	High surrogate recovery
	19FWOU633WG	cis-1,2-DCE trans-1,2-DCE TCE		

2.11 Completeness

Completeness scores were calculated for each analytical method employed for the project. Scores were obtained by assigning points to 14 different data quality categories during the review process. A maximum of 10 points was awarded for each category; points were based on the number of samples successfully meeting DQOs 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 on the following page. All OU6 site data quality categories met the completeness criteria of 90 percent established in the UFP-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 annual Monitoring Report.

Table B-5. Completeness Scores for Groundwater Samples

Data Quality Category	Points Mid-Level VOC	Points Low-Level VOC	Points DRO	Points RRO	Points Dissolved Fe/Mn	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	10	10	10	10	10	10
Trip Blanks	10	10	NA	NA	NA	NA
Equipment Blank	10	10	6	5	8	10
LCS/LCSD Recovery & RPD	10	10	10	9	10	10
MS/MSD Recovery & RPD	10	10	10	10	10	10
Surrogate Recovery	8	10	10	10	NA	NA
Field Duplicate	10	10	8	10	9	10
CCV, Internal Stds, other	10	10	10	10	10	10
Sensitivity (DL/LOD)	10	10	10	10	10	10
Total Points Received	138	140	124	124	117	120
Total Points Possible	140	140	130	130	120	120
Percent Completeness	99	100	95	95	98	100

NA – not applicable

3.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2019a. *Technical Memorandum – Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data.* October.

ADEC, 2019b. *Field Sampling Guidance*. October.

ADEC, 2018. *18 AAC 75, Oil and Other Hazardous Substances Pollution Control*. As amended through October 27, 2018.

Department of Defense (DoD), 2017. *Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1.*

Fairbanks Environmental Services (FES), 2019. *Final 2019 CERCLA Sites Work Plan – Operable Units 1 through 6.* 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:

Checklist: Laura Soeten, Validator: Christina Rink-Ashdown, Pei Geng (reviewed and revised by Vanessa Ritchie [FES Senior Chemist])

Title:

Executive Administrator, Senior Chemist, Senior Chemist

Date:

10/09/2019

CS Report Name:

Fort Wainwright Operable Unit 6

Report Date:

06/19/2019

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

APPL, Inc.

Laboratory Report Number:

88915

ADEC File Number:

108.38.085 (Former Communications Site)

Hazard Identification Number:

4140

88915

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   ☑ Yes ☐ No Comments:

Yes; however, EPA Method 300.0 is not listed as a CS analysis.

   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 Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

   ☑ Yes ☐ No Comments:

   b. Correct Analyses requested?

   ☑ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No 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 Comments:

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

The case narrative described LCS and ICV recovery discrepancies discussed in sections 6b and 7a.

c. Were all corrective actions documented?

☒ Yes ☐ No 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. 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 Comments:

The laboratory inadvertently did not login the dissolved iron/manganese and sulfate samples for equipment blank sample 19FWOU6EB01WQ; therefore, the samples were not analyzed. By the time the error was realized, the holding time for the samples had been exceeded. Impact to the project is negligible as the analytes are not site contaminants of concern.

b. All applicable holding times met?

☑ Yes ☐ No Comments:

The initial VOC analytical run was performed within holding time. However; all VOC samples were re-analyzed 2 to 3 days outside the 14-day holding time due to an ICV failure for vinyl chloride in the initial run (further discussed in section 7a). The results from the re-analysis confirmed the results of the initial analysis, so the results from the initial analysis are reported as primary. No data were qualified.

c. All soils reported on a dry weight basis?

☐ Yes ☑ No Comments:

No soil samples were included in this work order.

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

☑ Yes ☐ No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal (RG) or ADEC cleanup level (CUL) for non-detect results, as appropriate. Analytical sensitivity met project requirements for all analytes.

e. Data quality or usability affected?

☐ Yes ☑ No Comments:

See discussion in 5b above.

6. QC Samples

a. Method Blank

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

☑ Yes ☐ No Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

☑ Yes ☐ No Comments:

No analytes were detected in method blanks.

iii. If above LOQ, what samples are affected?

Comments:

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

☐ Yes ☒ No Comments:

Not applicable, no detected results were reported in the method blanks.

v. Data quality or usability affected?

Comments:

No data quality or usability was affected by the method blanks.

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 Comments:

LCS/LCSD and MS/MSD samples were analyzed in every batch as required, with the exception that the MS/MSD samples were not re-analyzed in the secondary VOC confirmation batch 240925. No data were impacted as the results from the initial analytical batch are reported as primary.

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

☐ Yes ☒ No Comments:

LCS/LCSD samples were analyzed in every metals and sulfate batch. A MS/MSD was analyzed in every batch except for sulfate batch 241232. The required volume for MS/MSD analyses was provided to the laboratory; however, the laboratory split the samples up into two batches. Although matrix interference cannot be evaluated in sulfate batch 241232, precision was evaluated through the LCS/LCSD.

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 Comments:

The RRO LCS/LCSD from batch 240939 exceeded the upper control limit (126%/130% vs 120%). RRO was detected in field duplicate samples 19FWOU609WG/19FWOU610WG and the results were qualified as estimates with a high bias (J+) due to the high recoveries. Impact to the project is negligible as the affected data are an order of magnitude less than the ROD RG and the results are consistent with historic data for this well (MW32R).

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 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 Comments:

See 6biii above.

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

Comments:

See 6biii above.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☉ Yes ○ No 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 Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

○ Yes ☉ No Comments:

No surrogate failures were reported.

iv. Data quality or usability affected?

Comments:

No data quality or usability was affected by the surrogates.

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d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?
(If not, enter explanation below.)

☑ Yes ☐ No 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 Comments:

Trip blank sample 19FWOU6TB01WQ for VOC analysis was included in cooler 051501.

iii. All results less than LOQ?

☑ Yes ☐ No Comments:

No target analytes were detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable. No target analytes were detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

Neither data quality nor usability was affected by the trip blank sample.

e. Field Duplicate

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

☑ Yes ☐ No Comments:

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

ii. Submitted blind to lab?

☑ Yes ☐ No Comments:

Sample 19FWOU602WG was a field duplicate of 19FWOU601WG and sample 19FWOU610WG was a field duplicate of 19FWOU609WG.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☒ No Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the LOD value followed by "U". 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, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 19FWOU601WG/19FWOU602WG were comparable (RPD ≤ 30%) with the exception of dissolved iron (31%) (identified in grey shading in the table below). Consequently, the field duplicate pair results were qualified as estimates (J) due to imprecision. Impact to the project was negligible as the RPD exceedance was marginal (1% high).

All (applicable) results for field duplicate sample pair 19FWOU609WG/19FWOU610WG were comparable (RPD ≤ 30%) with the exception of DRO (41%) (identified in grey shading in the table below). Consequently, the field duplicate pair results were qualified as estimates (J) due to imprecision. Although DRO is a ROD analyte, impact to the project is negligible as the affected results are approximately one order of magnitude less than the ROD RG and the results are within the typical concentration range observed for this crossgradient well (AP-MW32R).

Analyte	Method	Units	Primary 19FWOU601WG (MW47)	Field Duplicate 19FWOU602WG (MW471)	RPD, %	Comparable Criteria Met?
1,2,3-Trichloropropane	8260C-SIM	µg/L	0.30	0.31	3	Yes
Vinyl chloride	8260C-SIM	µg/L	0.015U	0.015U	0	Not applicable
Dissolved Iron	6020A	µg/L	48.3	35.3J	31	No
Dissolved Manganese	6020A	µg/L	148	146	1	Yes
Sulfate	300.0	mg/L	32.6	36.7	12	Yes

Analyte	Method	Units	Primary 19FWOU609WG (MW32R)	Field Duplicate 19FWOU610WG (MW321R)	RPD, %	Comparable Criteria Met?
DRO	AK102	mg/L	0.54	0.82	41	No
RRO	AK103	mg/L	0.25J	0.30J	18	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 applicable, a comment stating why must be entered below).

☑ Yes ☐ No ☐ Not Applicable

Equipment blank sample 19FWOU6EB01WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells in this SDG were sampled with a submersible pump with the exception of well MW91. Well MW91 (sample 19FWOU606WG) was sampled with a bladder pump using a new, disposable bladder due to a partial obstruction in the well casing.

i. All results less than LOQ?

☐ Yes ☑ No Comments:

No VOC, DRO, or RRO target analytes were detected in the equipment blank sample. As mentioned in section 5a, the dissolved iron/manganese and sulfate samples were inadvertently not analyzed so potential cross-contamination of these analytes cannot be evaluated.

ii. If above LOQ, what samples are affected?

Comments:

iii. Data quality or usability affected?

Comments:

Neither data quality nor usability was affected by the equipment blank sample.

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

a. Defined and appropriate?

☑ Yes ☐ No Comments:

The VOC initial calibration verification (ICV) from 5/24/19, standard 0524M23, had a percent difference (%D) reported above the control limit for vinyl chloride (24% vs. <20.0%). All VOC samples were re-analyzed 2 to 3 days outside of hold time (as discussed in section 5b) with no analytical discrepancies. The results of the second analytical run confirmed the results of the initial run. Since the results were confirmed and the initial batch was conducted within hold time, the initial results are reported as primary and no data were qualified.

Laboratory Data Review Checklist

Completed By:

Checklist: Laura Soeten, Validator: Christina Rink-Ashdown, Pei Geng (reviewed and revised by Vanessa Ritchie [FES Senior Chemist])

Title:

Executive Administrator, Senior Chemist, Senior Chemist

Date:

10/09/2019

CS Report Name:

Fort Wainwright Operable Unit 6

Report Date:

06/19/2019

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

APPL, Inc.

Laboratory Report Number:

88941

ADEC File Number:

108.38.085 (Former Communications Site)

Hazard Identification Number:

4140

88941

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   ☑ Yes ☐ No Comments:

Yes; however, EPA Method 300.0 is not listed as a CS analysis.

   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 Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

   ☑ Yes ☐ No Comments:

   b. Correct Analyses requested?

   ☑ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No 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 Comments:

No discrepancies were noted upon login.

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

The case narrative described MS/MSD, surrogate, and ICV recovery discrepancies discussed in sections 6b and 7a.

c. Were all corrective actions documented?

☒ Yes ☐ No 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. Any notable data quality issues mentioned in the case narrative are discussed above in 4b or elsewhere within this ADEC checklist.

88941

5. Samples Results

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

☐ Yes ☒ No Comments:

Low-level VOC analysis was not requested on the COC but was performed for samples 19FWOU623WG, 19FWOU624WG, and 19FWOU625WG. The project is set up with the laboratory to run specific analytes by mid-level 8260C (1,1-dichloroethene [DCE]; 1,2,3-TCP; cis-1,2-DCE; trans-1,2-DCE; tetrachloroethene [PCE]; trichloroethene [TCE]; and vinyl chloride) and a smaller sub-set by low-level 8260C-SIM (1,2,3-TCP and vinyl chloride). Consequently, since the low-level method was performed, several required analytes were not reported for these samples. This impacts the data for wells MW61 (primary and field duplicate) and MW80. As a corrective action, the wells were later re-sampled for mid-level 8260C and the results are reported in APPL report 89993.

b. All applicable holding times met?

☐ Yes ☒ No Comments:

The initial VOC analytical run was performed within holding time. However; all VOC samples were re-analyzed 1 to 2 days outside the 14-day holding time due to an ICV failure for vinyl chloride in the initial run (further discussed in section 7a). The results from the re-analysis confirmed the results of the initial analysis, so the results from the initial analysis are reported as primary. No data were qualified.

c. All soils reported on a dry weight basis?

☐ Yes ☒ No Comments:

No soil samples were included in this work order.

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

☒ Yes ☐ No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal (RG) or ADEC cleanup level for non-detect results, as appropriate. The RRO results in samples 19FWOU614WG (primary/MS/MSD), 19FWOU615WG, 19FWOU622WG, and 19FWOU629WG did not meet the ROD RG due to sample dilution (100x, 100x, 10x, and 20x, respectively). The samples were diluted because the extracts were highly colored and viscous (DRO concentrations were approximately an order of magnitude or more above the ROD RG). Impact to the project is negligible as the affected wells (MW33 and MW06A) are within a DRO plume and RRO in these wells is typically an order of magnitude below the RG.

All analytes that are non-detect with LODs elevated above ROD RGs are identified with gray shading in the results table (Table A-2) presented in the Annual Monitoring Report.

e. Data quality or usability affected?

☐ Yes ☒ No Comments:

See discussion in 5b and 5d above.

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6. QC Samples

a. Method Blank

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

☒ Yes ☐ No Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

☒ Yes ☐ No Comments:

iii. If above LOQ, what samples are affected?

Comments:

Dissolved manganese (0.38 µg/L) was detected at a concentration less than the LOQ in the method blank. All associated sample results were greater than five times that of the method blank so data qualification was not necessary.

No VOC, DRO, RRO, dissolved iron, or sulfate target analytes were detected.

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

☐ Yes ☒ No Comments:

v. Data quality or usability affected?

Comments:

No data quality or usability was affected by the method blanks.

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 Comments:

LCS/LCSD and MS/MSD samples were analyzed in every batch as required, with the exception that the MS/MSD samples were not re-analyzed in secondary VOC confirmation batch 240925. No data were impacted as the results from the initial analytical batch are reported as primary.

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

☐ Yes ☒ No Comments:

LCS/LCSD samples were analyzed in every metals and sulfate batch. MS/MSD samples were analyzed in every batch except for sulfate batch 241229. The required volume for MS/MSD analyses was provided to the laboratory; however, the laboratory split the samples up into two batches. Although matrix interference cannot be evaluated in sulfate batch 241229, precision was evaluated through the LCS/LCSD.

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 Comments:

The VOC MS/MSD prepared from sample 19FWOU623WG did not meet the lower control limit for vinyl chloride. However, the parent sample concentration exceeded the spike concentration so the recovery criteria did not apply. No data were qualified.

The DRO and RRO MS and/or MSD prepared from sample 19FWOU614WG exceeded the upper control limits. However, the DRO sample result exceeded the spike concentration by an order of magnitude and DRO/RRO sample was diluted by 100x so the recovery criteria was not applicable. No data were qualified.

The dissolved iron MS and/or MSD prepared from samples 19FWOU614WG and 19FWOU623WG did not meet control limits. However, the parent sample concentrations exceeded the spike concentrations so the recovery criteria did not apply. No data were qualified.

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 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 Comments:

See 6biii above.

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

Comments:

See 6biii above.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☑ Yes ☐ No 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 Comments:

The DRO surrogate o-terphenyl and RRO surrogate octacosane failed recovery criteria for samples 19FWOU614WG (primary/MS/MSD) and 19FWOU615WG (all 0%). The samples were diluted (100x) beyond the ability to quantitate recovery. No data were qualified.

The RRO surrogate n-octacosane recovery exceeded the upper control limit (153%/163% vs 150%) for samples 19FWOU616WG and 19FWOU628WG. The detected RRO results in these samples were qualified as estimates with a high bias (J+) due to the high surrogate recoveries. Impact to the project was negligible as the affected results are potentially high-biased and are an order of magnitude less than the ROD RG.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☑ Yes ☐ No Comments:

See 6cii above.

iv. Data quality or usability affected?

Comments:

See 6cii above.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?
(If not, enter explanation below.)

☑ Yes ☐ No 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 Comments:

Trip blank sample 19FWOU6TB02WQ for VOC analysis was included in cooler 051601.

iii. All results less than LOQ?

☑ Yes ☐ No Comments:

No target analytes were detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable. No target analytes were detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

Neither data quality nor usability was affected by the trip blank sample.

e. Field Duplicate

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

☑ Yes ☐ No Comments:

Three groundwater field duplicates were collected for the fifteen primary samples associated with this work order.

ii. Submitted blind to lab?

☑ Yes ☐ No Comments:

Sample 19FWOU615WG was a field duplicate of 19FWOU614WG, sample 19FWOU624WG was a field duplicate of 19FWOU623WG, and sample 19FWOU628WG was a field duplicate of 19FWOU627WG.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☒ No Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the LOD value followed by "U". 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, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 19FWOU614WG/19FWOU615WG were comparable (RPD ≤ 30%) with the exception of DRO (32%) (identified in grey shading in the table below). Consequently, the field duplicate pair results were qualified as estimates (J) due to imprecision. Impact to the project is negligible as the RPD exceedance was marginal (2% high). This well (MW33) consistently has DRO at concentrations exceeding the ROD RG by more than an order of magnitude.

All (applicable) results for field duplicate sample pair 19FWOU623WG/19FWOU624WG were comparable (RPD ≤ 30%).

All (applicable) results for field duplicate sample pair 19FWOU627WG/19FWOU628WG were comparable (RPD ≤ 30%) with the exception of RRO (49%) (identified in grey shading in the table below). Consequently, the field duplicate pair results were qualified as estimates (J) due to imprecision. Precision may have been impacted by submersible pump cross-contamination as suggested by a similar result in the equipment blank sample (see section 6f). Overall the impact to the project due to the imprecision is negligible as the affected results are less than the ROD RG and the results are consistent with the concentration range observed in this well (MW06A).

Analyte	Method	Units	Primary 19FWOU614WG (MW33)	Field Duplicate 19FWOU615WG (MW331)	RPD, %	Comparable Criteria Met?
DRO	AK102	mg/L	69	95	32	No
RRO	AK103	mg/L	20.00U	20.00U	0	Not applicable
Dissolved Iron	6020A	µg/L	43400	45000	4	Yes
Dissolved Manganese	6020A	µg/L	2880	3060	6	Yes
Sulfate	300.0	mg/L	4.5	4.1	9	Yes

Analyte	Method	Units	Primary 19FWOU623WG (MW61)	Field Duplicate 19FWOU624WG (MW611)	RPD, %	Comparable Criteria Met?
1,2,3-Trichloropropane	8260C	µg/L	0.0050U	0.0050U	0	Not applicable
Vinyl chloride	8260C	µg/L	0.42	0.40	5	Yes

Analyte	Method	Units	Primary 19FWOU627WG (MW58)	Field Duplicate 19FWOU628WG (MW581)	RPD, %	Comparable Criteria Met?
DRO	AK102	mg/L	4.5	4.5	0	Yes
RRO	AK103	mg/L	0.32J	0.53	49	No
Dissolved Iron	6020A	µg/L	17500	17400	1	Yes
Dissolved Manganese	6020A	µg/L	1100	1060	4	Yes
Sulfate	300.0	mg/L	15.8	15.7	1	Yes

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 applicable, a comment stating why must be entered below).

☉ Yes ☐ No ☐ Not Applicable

Equipment blank samples 19FWOU6EB02WQ (dissolved iron/manganese, sulfate, DRO and RRO) and 19FWOU6EB03WQ (VOC) were included in this work order to assess the potential for cross-contamination of the submersible pump. All wells in this SDG were sampled with a submersible pump, per the UFP-QAPP.

i. All results less than LOQ?

☐ Yes ☉ No Comments:

Dissolved iron (75.7 µg/L) and dissolved manganese (5.6 µg/L) were detected at concentrations above the LOQ. The dissolved iron results for samples 19FWOU612WG, 19FWOU613WG, 19FWOU619WG, 19FWOU620WG, 19FWOU622WG, and 19FWOU626WG were less than five times that of the equipment blank concentration and qualified (B) due to potential pump cross-contamination. All manganese sample results were greater than five times that of the equipment blank so data qualifications were not necessary.

DRO (0.17 mg/L) was detected at a concentration above the LOQ and RRO (0.13 mg/L) was detected at a concentration below the LOQ. The DRO and RRO results for samples 19FWOU612WG, 19FWOU613WG, 19FWOU616WG, 19FWOU617WG, 19FWOU620WG, 19FWOU621WG, and 19FWOU626WG were less than five times that of the equipment blank concentrations. In addition, RRO results for samples 19FWOU619WG and 19FWOU627WG, and 19FWOU628WG were less than five times that of the equipment blank concentration. All aforementioned DRO and RRO results were qualified (B) due to pump cross-contamination. Although several results were qualified, none of the impact results exceed the ROD RGs.

No sulfate or VOC target analytes were detected.

ii. If above LOQ, what samples are affected?

Comments:

iii. Data quality or usability affected?

Comments:

See 6fi above.

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

a. Defined and appropriate?

☒ Yes ☐ No Comments:

The VOC initial calibration verification (ICV) from 5/24/19, standard 0524M23, had a percent difference (%D) reported above the control limit for vinyl chloride (24% vs. <20.0%). All VOC samples were re-analyzed 1 to 2 days outside of hold time (as discussed in section 5b) with no analytical discrepancies. The results of the second analytical run confirmed the results of the initial run. Since the results were confirmed and the initial batch was conducted within hold time, the initial results are reported as primary and no data were qualified.

Laboratory Data Review Checklist

Completed By:

Checklist: Laura Soeten, Validator: Christina Rink-Ashdown, Pei Geng (reviewed and revised by Vanessa Ritchie [FES Senior Chemist])

Title:

Executive Administrator, Senior Chemist, Senior Chemist

Date:

10/09/2019

CS Report Name:

Fort Wainwright Operable Unit 6

Report Date:

09/24/2019

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

APPL, Inc.

Laboratory Report Number:

89993

ADEC File Number:

108.38.085 (Former Communications Site)

Hazard Identification Number:

4140

89993

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   ☑ Yes ☐ No Comments:

   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 Comments:

   Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

   ☑ Yes ☐ No Comments:

   b. Correct Analyses requested?

   ☑ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

   One of three VOC VOA vials for sample 19FWOU632WG was reported to have an air bubble "smaller than a pea" and one of three VOA vials for trip blank sample 19FWOU6TB03WQ was reported to have an air bubble "larger than a pea". VOC analysis was performed on VOAs without headspace, so no data were impacted.

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

☒ Yes ☐ No Comments:

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

The case narrative described surrogate, LCS, MS/MSD, and ICV recovery discrepancies discussed in sections 6b, 6c, and 7a.

c. Were all corrective actions documented?

☒ Yes ☐ No 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. 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 Comments:

b. All applicable holding times met?

☒ Yes ☐ No Comments:

The VOC samples were analyzed a few hours outside of the 14-day holding time window. However, since the analysis occurred within the 14th day, no data were qualified.

c. All soils reported on a dry weight basis?

☐ Yes ☒ No Comments:

No soil samples were included in this work order.

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

☒ Yes ☐ No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal (RG) or ADEC cleanup level (CUL) for non-detect results, as appropriate. Vinyl chloride and 1,2,3-trichloropropane in samples 19FWOU631WG through 19FWOU633WG, equipment blank 19FWOU6EB04WQ, and trip blank 19FWOU6TB03WG did not meet the applicable action level for the mid-level 8260C method. These analytes may not be detected, if present, at the respective action level. However, the analytical limitations for these analytes by this method were presented in the approved Work Plan. Note that these compounds are analyzed by the low-level 8260C method in select OU6 wells where a lower detection limit is desired, as detailed in the 2019 CERCLA Sites Work Plan (FES, 2019).

All analytes that are non-detect with LODs elevated above RGs or CULs are identified with gray shading in the results table (Table A-2) presented in the Annual Monitoring Report.

e. Data quality or usability affected?

☐ Yes ☒ No Comments:

See discussion in 5b and 5d above.

6. QC Samples

a. Method Blank

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

☒ Yes ☐ No Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

☒ Yes ☐ No Comments:

No target analytes were detected in method blank samples.

iii. If above LOQ, what samples are affected?

Comments:

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

☐ Yes ☒ No Comments:

Not applicable, no detected results were reported in the method blanks.

v. Data quality or usability affected?

Comments:

No data quality or usability was affected by the method blanks.

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 Comments:

LCS/LCSD and MS/MSD samples were analyzed in every batch as required, with the exception that VOC batch 244602 did not contain a project-specific MS/MSD sample. The laboratory split the VOC samples into multiple batches. Although matrix interference cannot be evaluated, batch accuracy and precision can be evaluated through the LCS/LCSD samples.

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

☐ Yes ☒ No Comments:

No metals or inorganics were included in this report.

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 Comments:

The VOC LCS-244601 exceeded the upper control limit for trichloroethene (TCE) (134% vs 123%). Two project samples were associated with this batch and TCE was not detected in either sample, so no results were qualified due to the high-biased recovery.

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 Comments:

The VOC MS/MSD prepared from sample 19FWOU632WG did not meet the RPD control limit for tetrachloroethene (20.6% vs 20%). Tetrachloroethene was not detected in parent sample and associated field duplicate sample. Since only detected results are affected, no sample qualifications were 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 Comments:

See 6biii and 6biv above.

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

Comments:

Neither data quality nor usability was affected by the MS/MSD or LCS/LCSD analysis.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☒ Yes ☐ No 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 Comments:

Sample 19FWOU631WG had surrogate recoveries that exceeded the upper control limit: 1,2-dichloroethane-d4 (119% vs 118%), 4-bromofluorobenzene (123% vs 114%), and toluene-d8 (121% vs 112%). All VOC results were non-detect in this sample. Since all surrogates failed high and the associated results were non-detect, no sample qualifications were necessary.

Sample 19FWOU632WG had surrogate recoveries that exceeded the upper control limit: 4-bromofluorobenzene (127% vs 114%) and toluene-d8 (132% vs 112%). The detected VOC results (cis- and trans-1,2-dichloroethene) in this sample were qualified as estimates with a high bias (J+) due to the high recoveries. Impact to the project was negligible as the affected data were a minimum of six times greater than the ADEC CULs.

Sample 19FWOU633WG had surrogate recoveries that exceeded the upper control limit: 1,2-dichloroethane-d4 (122% vs 118%) and dibromofluoromethane (121% vs 119%). The detected VOC results (cis- and -trans-1,2-dichloroethene and TCE) in this sample were qualified as estimates with a high bias (J+) due to the high recoveries. Impact to the project was negligible as the affected data were a minimum of six times greater than the ROD RG and/or ADEC CULs.

Trip blank sample 19FWOU6TB03WG had surrogate recoveries that exceeded the upper control limit: 4-bromofluorobenzene (130% vs 114%) and toluene-d8 (123% vs 112%). All VOC results were non-detect in this sample. Since all surrogates failed high and the associated results were nondetect, no sample qualifications were necessary.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☑ Yes ☐ No Comments:

See 6cii above.

iv. Data quality or usability affected?

Comments:

See 6cii above.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?
(If not, enter explanation below.)

☑ Yes ☐ No 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 Comments:

Trip blank sample 19FWOU6TB03WQ for VOC analysis was included in cooler 082701.

iii. All results less than LOQ?

☑ Yes ☐ No Comments:

No target analytes were detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable. No target analytes were detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

Neither data quality nor usability was affected by the trip blank sample.

e. Field Duplicate

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

☒ Yes ☐ No Comments:

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

ii. Submitted blind to lab?

☒ Yes ☐ No Comments:

Sample 19FWOU633WG was a field duplicate of 19FWOU632WG.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☒ No Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the LOD value followed by "U". 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, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 19FWOU632WG/19FWOU633WG were comparable (RPD ≤ 30%).

Analyte	Method	Units	Primary 19FWOU632WG (MW61)	Field Duplicate 19FWOU633WG (MW611)	RPD, %	Comparable Criteria Met?
1,1-Dichloroethene	8260C	µg/L	0.50U	0.50U	0	Not applicable
1,2,3-Trichloropropane	8260C	µg/L	1.00U	1.00U	0	Not applicable
cis-1,2-Dichloroethene	8260C	µg/L	6.1	6.9	12	Yes
Tetrachloroethene	8260C	µg/L	0.30U	0.30U	0	Not applicable
trans-1,2-dichloroethene	8260C	µg/L	6.5	7.0	7	Yes
Trichloroethene	8260C	µg/L	0.30U	0.67J	76	Not applicable
Vinyl chloride	8260C	µg/L	0.30U	0.30U	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 applicable, a comment stating why must be entered below).

☑ Yes ☐ No ☐ Not Applicable

Equipment blank sample 19FWOU6EB04WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells in this SDG were sampled with a submersible pump, per the UFP-QAPP.

i. All results less than LOQ?

☐ Yes ☑ No Comments:

No VOC target analytes were detected.

ii. If above LOQ, what samples are affected?

Comments:

iii. Data quality or usability affected?

Comments:

Neither data quality nor usability was affected by the equipment blank sample.

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

a. Defined and appropriate?

☑ Yes ☐ No Comments:

The VOC initial calibration verification (ICV) from 9/10/19, standard 0909T44, had a percent difference (%D) reported above the control limit for vinyl chloride (23% vs. <20.0%). All VOC samples were associated and were non-detect for vinyl chloride. Since the ICV failed high and the associated results were non-detect, no sample qualification was necessary.

APPENDIX C

GROUNDWATER SAMPLING FORMS AND FIELD NOTES

Table C-1. 2018-2019 OU6 Groundwater Sample Field Measurements

Well ID	Sample ID	Sample Date	Sample Time	Field Measurements									
				Water Depth[1] (feet btoc)	Water Table Within Well Screen Interval (Y/N)	Drawdown (feet)	Temp (°C)	Conductivity (mS/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Well Stabilized[3] (Y/N)
MW-03	18FWOU605WG	6/20/2018	1420	14.28	Y	0.00	7.21	0.608	0.61	6.89	-74.30	7.36	Y
	18FWOU647WG	9/26/2018	910	13.34	Y	0.00	6.85	0.567	1.42	6.77	-92.00	12.93	Y
	19FWOU617WG	5/15/2019	1015	16.17	Y	0.00	6.22	0.617	0.55	6.94	-63.90	22.23	Y
MW-06A	18FWOU607WG	6/20/2018	1630	14.68	Y	0.00	7.02	0.576	0.81	6.87	-153.20	1.78	Y
	18FWOU652WG	9/26/2018	1510	13.68	Y	0.00	7.33	0.660	1.19	6.63	-60.40	4.15	Y
	19FWOU629WG	5/16/2019	930	16.50	Y	0.00	4.72	0.617	0.39	6.90	-86.5	6.39	Y
MW-08	18FWOU623WG	6/22/2018	1640	16.90	Y	0.00	4.27	0.668	1.39	6.63	117.10	1.01	Y
	18FWOU639WG	9/21/2018	1200	16.04	Y	0.00	5.94	0.603	1.66	6.65	123.60	1.37	Y
	19FWOU603WG	5/13/2019	1340	18.75	Y	0.00	4.60	0.635	2.21	6.69	141.80	2.73	Y
MW-12R	18FWOU603WG	6/20/2018	1300	11.48	N	0.00	4.86	0.459	1.15	7.01	-152.30	2.41	Y
	18FWOU649WG	9/26/2018	1155	10.50	N	0.00	6.45	0.390	1.51	7.01	-109.00	5.45	Y
	19FWOU616WG	5/14/2019	1500	13.39	Y	0.00	5.07	0.438	0.33	7.18	-104.10	1.92	Y
MW-13	18FWOU627WG	6/25/2018	1200	15.09	Y	0.00	4.39	0.706	2.32	6.78	31.60	1.17	Y
	18FWOU640WG	9/21/2018	1320	14.04	Y	0.00	4.75	0.939	0.60	6.55	57.20	1.00	Y
	19FWOU611WG	5/13/2019	1705	16.95	Y	0.00	3.08	0.735	0.72	6.71	32.90	0.89	Y
MW-28	18FWOU604WG	6/20/2018	1440	16.10	Y	0.00	8.18	0.712	1.29	6.78	94.40	3.13	Y
	18FWOU648WG	9/26/2018	1040	15.12	Y	0.00	8.79	0.570	0.84	6.79	53.90	4.01	Y
	19FWOU612WG	5/14/2019	1020	18.01	Y	0.01	6.73	0.711	0.91	6.85	158.20	5.02	Y
MW-32R	18FWOU628WG	6/25/2018	1330	13.14	Y	0.00	6.94	0.986	3.33	6.62	112.40	5.74	Y
	18FWOU642WG	9/21/2018	1450	12.20	N	0.00	6.63	0.792	0.81	6.63	106.90	4.60	Y
	19FWOU609WG	5/13/2019	1530	14.96	Y	0.00	6.05	0.867	0.95	6.76	117.90	8.36	Y
MW-33	18FWOU601WG	6/20/2018	1045	14.49	Y	0.00	5.40	0.754	0.54	6.87	-132.00	10.79	Y
	18FWOU650WG	9/26/2018	1315	13.48	Y	0.00	7.50	0.765	1.30	6.65	-109.00	11.85	Y
	19FWOU614WG	5/14/2019	1325	16.42	Y	0.01	4.58	0.852	0.41	6.90	-109.40	6.97	Y
MW-35	18FWOU610WG	6/21/2018	1020	12.85	Y	0.00	4.99	0.852	1.88	6.81	88.10	1.80	Y
	18FWOU653WG	9/26/2018	1645	11.82	Y	0.00	6.56	0.684	0.75	6.69	46.50	4.23	Y
	19FWOU626WG	5/15/2019	1520	14.70	Y	0.00	6.34	0.960	0.74	6.79	111.90	5.06	Y
MW-37	18FWOU612WG	6/21/2018	1145	14.17	Y	0.00	13.47	0.669	1.17	7.03	97.70	1.15	Y
	18FWOU654WG	9/26/2018	1835	13.11	Y	0.00	13.32	0.640	1.34	6.89	68.10	1.32	Y
	19FWOU619WG	5/14/2019	1150	16.03	Y	0.00	10.26	0.598	0.70	7.01	66.90	3.16	Y
MW-38	18FWOU606WG	6/20/2018	1610	13.46	Y	0.00	6.67	0.783	1.65	7.02	53.00	3.76	Y
	18FWOU646WG	9/21/2018	1615	12.68	Y	0.00	6.26	0.713	0.60	6.81	-52.60	16.10	Y
	19FWOU621WG	5/14/2019	1450	15.40	Y	0.00	4.83	0.805	0.70	7.01	-49.60	4.26	Y
MW-39	18FWOU617WG	6/22/2018	945	15.22	Y	0.00	5.75	0.533	0.97	7.15	-116.00	7.21	Y
	18FWOU631WG	9/20/2018	1045	14.38	Y	0.00	6.50	0.443	1.08	7.08	-113.60	34.81	Y
	19FWOU607WG	5/13/2019	1220	17.05	Y	0.00	6.02	0.567	0.60	7.23	-105.50	7.78	Y
MW-47	18FWOU620WG	6/22/2018	1445	14.84	Y	0.00	5.98	0.727	1.94	6.91	81.80	0.70	Y
	18FWOU634WG	9/20/2018	1440	13.98	Y	0.00	7.78	0.682	4.23	6.85	53.20	4.11	Y
	19FWOU601WG	5/13/2019	1050	16.71	Y	0.00	4.50	0.660	1.01	7.12	144.10	3.24	Y
MW-48	18FWOU626WG	6/25/2018	1030	14.94	Y	0.00	4.84	0.698	2.62	6.97	70.80	1.39	Y
	18FWOU637WG	9/21/2018	1040	14.03	Y	0.00	7.25	0.827	1.01	6.87	76.30	2.80	Y
	19FWOU604WG	5/13/2019	1505	16.72	Y	0.00	4.72	0.842	2.26	6.95	67.60	4.39	Y
MW-58	18FWOU608WG	6/21/2018	845	11.96	Y	0.00	4.86	0.543	1.63	6.90	-68.50	4.53	Y
	18FWOU655WG	9/27/2018	900	10.91	Y	0.00	4.83	0.468	1.60	6.92	-108.50	7.93	Y
	19FWOU627WG	5/16/2019	840	13.82	Y	0.00	4.52	0.528	0.68	7.03	-67.50	18.52	Y
MW-61	18FWOU622WG	6/22/2018	1445	13.62	Y	0.00	6.11	0.685	0.84	7.85	26.90	6.29	Y
	18FWOU644WG	9/21/2018	1500	12.79	Y	0.00	6.81	0.717	1.58	6.84	-58.50	6.27	Y
	19FWOU623WG	5/15/2019	1220	15.48	Y	0.00	6.43	0.634	0.43	7.06	-68.40	20.42	Y
MW-62	18FWOU613WG	6/21/2018	1135	12.82	Y	0.00	5.89	0.708	0.38	7.15	14.50	2.02	Y
	18FWOU658WG	9/27/2018	1045	11.78	Y	0.00	7.00	0.655	0.55	6.64	18.20	2.07	Y
	19FWOU613WG	5/14/2019	1200	14.76	Y	0.00	5.45	1.062	0.63	6.73	165.10	3.55	Y
MW-64	18FWOU611WG	6/21/2018	1005	13.43	Y	0.00	5.84	0.475	2.38	7.22	-15.70	13.56	Y
	18FWOU659WG	9/27/2018	1030	12.41	Y	0.00	6.56	0.493	1.81	6.99	-28.50	3.63	Y
	19FWOU630WG	5/16/2019	1030	15.30	Y	0.00	5.75	0.499	0.47	7.18	-37.4	9.37	Y
MW-77	18FWOU615WG	6/21/2018	1310	16.62	Y	0.00	6.43	1.204	0.42	7.06	47.60	4.71	Y
	18FWOU657WG	9/27/2018	930	15.59	Y	0.00	4.80	0.836	0.10	6.69	19.90	3.30	Y
	19FWOU622WG	5/15/2019	1535	18.61	Y	Did not collect parameters due to presence of product							
MW-78	18FWOU616WG	6/22/2018	845	15.44	N	0.00	6.05	0.456	0.94	7.25	-150.20	18.23	Y
	18FWOU633WG	9/20/2018	1330	14.43	N	0.00	6.58	0.424	1.51	7.18	-127.60	8.03	Y
	19FWOU608WG	5/13/2019	1400	17.28	N	0.00	6.15	0.527	0.37	7.26	-110.00	13.21	Y
MW-79	18FWOU618WG	6/22/2018	1100	16.92	Y	0.00	4.90	0.640	1.40	6.92	-21.20	7.34	Y
	18FWOU636WG	9/21/2018	930	16.01	Y	0.00	7.32	0.668	1.51	6.87	-8.70	5.71	Y
	19FWOU605WG	5/13/2019	1645	18.77	Y	0.00	4.66	0.623	0.82	7.10	-55.80	4.13	Y
MW-80	18FWOU624WG	6/22/2018	1555	13.15	N	0.00	5.51	0.378	0.40	8.32	-5.80	5.96	Y
	18FWOU641WG	9/21/2018	1330	12.33	N	0.00	5.22	0.372	1.33	7.18	-119.10	6.18	Y
	19FWOU625WG	5/15/2019	1345	15.00	N	0.00	6.56	0.405	0.24	7.33	-100.4	23.56	Y
MW-82	18FWOU614WG	6/21/2018	1315	16.17	Y	0.00	7.62	0.865	1.87	6.73	126.10	1.91	Y
	18FWOU660WG	9/27/2018	1130	15.00	Y	0.00	7.46	0.895	1.57	6.67	61.10	1.32	Y
	19FWOU620WG	5/14/2019	1300	18.02	Y	0.05	6.58	0.872	0.68	6.72	102.0	3.80	Y
MW-91	18FWOU625WG	6/25/2018	915	15.78	N	0.00	5.80	0.392	0.63	7.40	-159.20	0.61	Y
	18FWOU638WG	9/21/2018	1115	14.55	N	0.00	5.42	0.367	0.55	7.23	-118.90	1.88	Y
	19FWOU606WG	5/13/2019	1100	17.48	Y	0.00	5.41	0.428	0.73	7.33	-120.20	0.69	Y
MW-93	18FWOU619WG	6/22/2018	1315	15.40	N	0.00	6.81	0.399	0.90	7.60	-150.40	0.61	Y
	18FWOU632WG	9/20/2018	1200	14.53	N	0.00	6.00	0.376	1.07	7.48	-148.60	2.33	Y
	19FWOU618WG	5/14/2019	1020	17.48	Y	0.00	5.86	0.419	0.49	7.56	-116.70	2.88	Y

Notes:

[1] Water depth shown was the static level measured on the date shown prior to purging the well

[2] Drawdown measured during the last three readings.

[3] Stabilization parameters described in ADEC Field Sampling Guidance (ADEC, 2019). Impact to data quality is discussed in the CDQR.

Acronyms

bgs - below ground surface
btoc - below top of casing
°C - degree Celsius
CDQR - Chemical Data Quality Review
DO - dissolved oxygen
mg/L - milligrams per liter
mS/cm - milliSiemens per centimeter
mV - millivolts
NA - not applicable or not available
NM - not measured
NTU - nephelometric turbidity units
ORP - oxidation reduction potential

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/15/19 | **Probe/Well #:** MW03

Time: 10:15 | **Sample ID:** 19FWOU6 17 WG

Sampler: Mikayla Daigle

Weather: Sunny | **Outside Temperature:** 54°F

QA/QC Sample ID/Time/LOCID: — | **MS/MSD Performed?** Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | **Sample Method:** Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 22.30

Depth to Water from TOC (feet): - 16.17

Column of Water in Probe/Well (feet): = 6.13

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

Volume of Water in 1 Probe/Well Casing (gal): 0.99

Sampling Depth

Well Screened (Across) / Below water table — Screened 12.3-22.3 btoc

Depth tubing / pump intake set* approx. 19.17 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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.4	10	6.14	0.616	1.44	6.83	-49.7	128.10	16.18
2.1	15	6.13	0.617	1.26	6.90	-54.1	99.79	16.19
2.8	20	6.48	0.617	0.99	6.91	-56.9	74.50	16.19
3.5	25	6.46	0.617	0.83	6.94	-58.8	69.74	16.19
4.2	30	6.74	0.616	0.79	6.95	-60.3	65.27	16.19
4.9	35	6.58	0.617	0.74	6.96	-61.3	54.26	16.19
5.6	40	6.10	0.617	0.66	6.94	-61.2	40.28	16.19
6.3	45	6.04	0.617	0.63	6.92	-60.9	32.22	16.19
7.0	50	6.16	0.617	0.58	6.92	-61.9	30.43	16.19
7.7	55	6.22	0.617	0.55	6.94	-63.9	22.23	

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: Eventually ran clear

Well Condition: Locked (Y) N | Labeled with LOC ID: (Y) N | **Comments:** —

Sheen: Yes / (No) | **Odor:** Yes / (No) | **Notes/Comments:** —

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: (Y) N | **Approximate volume added (mL):** HCl = 0 | HNO_3 = 0

Purge Water

Gallons generated: 8.5 | Containerized and disposed as IDW? (Yes) / No | If No, why not?

Disposal method*: POL Water / (CERCLA Waste) | * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/16/19 | **Probe/Well #:** MW06A

Time: 09:30 | **Sample ID:** 19FWOU6 29 WG

Sampler: Mikayla Daigle

Weather: Sunny | **Outside Temperature:** 58°F

QA/QC Sample ID/Time/LOCID: — | **MS/MSD Performed? Yes/ (No)**

Purge Method: Peristaltic Pump / (Submersible) / Bladder | **Sample Method:** Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 22.70

Depth to Water from TOC (feet): - 16.50

Column of Water in Probe/Well (feet): = 6.20

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): 1.01

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 18.50 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.4	10	4.56	0.620	0.57	6.80	-70.9	7.82	16.52
2.1	15	4.76	0.618	0.50	6.86	-80.0	12.21	16.52
2.8	20	4.78	0.618	0.46	6.89	-84.1	6.71	16.52
3.5	25	4.72	0.617	0.39	6.90	-86.5	6.39	

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:** —

* Dissolved metals include iron, manganese, ~~phosphorus~~, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, (DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: (Y) / N **Approximate volume added (mL):** HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 4.25 Containerized and disposed as IDW? (Yes) / No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/13/19 | **Probe/Well #:** MW08

Time: 13:40 | **Sample ID:** 19FWOU6 03 WG

Sampler: M. Kayla Daigle

Weather: Sunny | **Outside Temperature:** 60°F

QA/QC Sample ID/Time/LOCID: — | **MS/MSD Performed? Yes/(No)**

Purge Method: Peristaltic Pump / (Submersible) / Bladder | **Sample Method:** Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 22.15

Depth to Water from TOC (feet): - 18.75

Column of Water in Probe/Well (feet): = 3.40

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

Volume of Water in 1 Probe/Well Casing (gal): 0.55

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx 20.75 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)
1.2	10	4.61	0.635	2.50	6.64	153.4	3.18	18.83
1.8	15	4.73	0.634	2.27	6.67	148.0	4.23	18.85
2.4	20	4.62	0.634	2.21	6.72	144.2	2.89	18.85
3.0	25	4.60	0.635	2.21	6.69	141.8	2.73	18.85

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:** —

* Dissolved metals include iron, manganese, ~~phosphorus~~, and potassium

Laboratory Analyses (Circle): VOC, (VOC-LL), DRO, RRO, ~~Methane~~, Dissolved Metals*, ~~Sulfate~~, ~~Alkalinity~~, ~~Ammonia as N~~, ~~Nitrate/Nitrite as N~~

pH checked of samples: (Y) N **Approximate volume added (mL):** HCl = X HNO3 = 0

Purge Water

Gallons generated: 5 Containerized and disposed as IDW? (Yes) / No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/14/19 | **Probe/Well #:** MW12R

Time: 1500 | **Sample ID:** 19FWOU6 16 WG

Sampler: CB

Weather: MOSTLY CLOUDY | **Outside Temperature:** 59 °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 # 7 | **Turbidity Meter #:** 12 | **Water Level:** 13

Free Product Observed in Probe/Well? Yes/(No) | **If Yes, Depth to Product:** —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 22.60

Depth to Water from TOC (feet): - 13.39

Column of Water in Probe/Well (feet): = 9.21

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): 1.5

Sampling Depth

Well Screened (Across) / **Below** water table

Depth tubing / pump intake set* approx. 14.5 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.

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)
1.5	10	4.97	0.440	0.33	7.17	-100.1	2.92	13.42
2.25	15	5.10	0.439	0.33	7.17	-101.1	2.56	13.42
3	20	5.12	0.439	0.33	7.17	-103.4	2.43	13.42
3.75	25	5.07	0.438	0.33	7.18	-104.1	1.92	13.42
~~4.5~~	~~30~~							
				CB				

Did groundwater parameters stabilize? (Yes) / No **If no, why not?** —

Did drawdown stabilize? (Yes) / No **If no, why not?** —

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

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

Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) N **Comments:** FLUSHMOUNT

Sheen: Yes / (No) **Odor:** Yes / (No) **Notes/Comments:** —

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, ~~DRO~~, ~~RRO~~, Methane, Dissolved Metals*, ~~Sulfate~~, Alkalinity, Ammonia as N, Nitrate/Nitrite as N Fe/Mn

pH checked of samples: (Y) N **Approximate volume added (mL):** HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 4 Containerized and disposed as IDW? (Yes) No If No, why not?

Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/13/19 | Probe/Well #: MW13

Time: 1705 | Sample ID: 19FWOU6 11 WG

Sampler: CB

Weather: PARTLY CLOUDY | Outside Temperature: 6 30°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 # 7 | Turbidity Meter #: 12 | Water Level: 13

Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: ———

Column of Water in Probe/Well | **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 19.21 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 16.95 | Depth tubing / pump intake set* approx. 18.9 feet below top of casing

Column of Water in Probe/Well (feet): = 2.26 | *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): 0.37

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)
1.5	10	2.74	0.764	1.04	6.70	38.5	4.36	17.09
2.25	15	3.54	0.759	1.01	6.70	40.9	2.98	17.09
3	20	3.18	0.751	0.84	6.71	40.1	2.50	17.09
3.75	25	3.09	0.743	0.77	6.69	38.7	1.07	17.09
4.5	30	3.12	0.737	0.73	6.71	35.9	1.52	17.09
5.25	35	3.08	0.735	0.72	6.71	32.9	0.89	17.09
				CB				

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: ———

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: (Y) / N Approximate volume added (mL): HCl = NA HNO3 = 10

Purge Water

Gallons generated: 5.5 Containerized and disposed as IDW? (Yes) / No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/14/19 | **Probe/Well #:** MW28

Time: 1020 | **Sample ID:** 19FWOU6 12 WG

Sampler: CB

Weather: CLOUDY | **Outside Temperature:** 47°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 # 7 | **Turbidity Meter #:** 12 | **Water Level:** 13

Free Product Observed in Probe/Well? Yes/No | **If Yes, Depth to Product:** —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 19.17

Depth to Water from TOC (feet): - 18.01

Column of Water in Probe/Well (feet): = 1.16

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

Volume of Water in 1 Probe/Well Casing (gal): 0.19

Sampling Depth

Well Screened ~~Across~~ / Below water table

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

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	6.93	0.730	2.91	6.85	161.7	12.90	18.06
2.25	15	6.80	0.720	1.59	6.85	160.0	10.13	18.06
3	20	6.75	0.716	1.31	6.85	159.2	7.88	18.06
3.75	25	6.73	0.712	0.93	6.84	157.9	5.00	18.06
4.5	30	6.73	0.711	0.91	6.85	158.2	5.02	18.07
				CB				

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:** INITIAL 0.25 GAL.

Well Condition: Locked / N **Labeled with LOC ID:** Y / N **Comments:** HAD HIGH IRON CONTENT

Sheen: Yes / No **Odor:** Yes / No **Notes/Comments:** (ORANGE)

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N (Fe/Mn)

pH checked of samples: Y / N **Approximate volume added (mL):** HCl = 0 HNO3 = 0

Purge Water

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

Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/13/19 | Probe/Well #: MW32R

Time: 1530 | Sample ID: 19FWOU6 09 WG

Sampler: CB

Weather: CLOUDY | Outside Temperature: 61

MW32R DRO / RRO ONLY

QA/QC Sample ID/Time/LOCID: 19FWOU6 10WG / 1545 / AB [redacted] | MS/MSD Performed? Yes / No

Purge Method: Peristaltic Pump / ~~Submersible~~ / Bladder | Sample Method: Peristaltic Pump / ~~Submersible~~ / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 7 | Turbidity Meter #: 12 | Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 23.03

Depth to Water from TOC (feet): - 14.96

Column of Water in Probe/Well (feet): = 8.07

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): 1.32

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 16.9 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	6.22	0.866	1.24	6.75	128.9	91.08	15.01
2.25	15	6.15	0.870	1.15	6.75	127.0	46.30	15.01
3	20	6.07	0.872	1.09	6.75	126.5	20.16	15.02
3.75	25	6.03	0.872	1.04	6.76	126.0	10.90	15.02
4.5	30	6.02	0.869	0.98	6.76	119.9	8.46	15.02
5.25	35	6.05	0.867	~~0.95~~	6.76	117.9	8.36	15.02

CB

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: FLUSH MOUNT

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

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: Y / N | Approximate volume added (mL): HCl = 0 | HNO_3 = 0

Purge Water

Gallons generated: 5.5 | Containerized and disposed as IDW? Yes / No | If No, why not?

Disposal method*: POL Water / CERCLA Waste | * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/14/19 | Probe/Well #: MW 33

Time: 1325 | Sample ID: 19FWOU6 14 WG

Sampler: CB

Weather: CLOUDY | Outside Temperature: 55°F MW331

QA/QC Sample ID/Time/LOCID: 19FWOU6 15WG / 1340 / ~~AR 1070~~ | 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 #: 12 | Water Level: 13

Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: ——

Column of Water in Probe/Well		Sampling Depth
Total Depth in Probe/Well (feet btoc):	20.95	Well Screened ~~Across~~ / **Below** water table
Depth to Water from TOC (feet):	- 16.42	Depth tubing / pump intake set* approx. 18.4 feet below top of casing
Column of Water in Probe/Well (feet):	= 4.53	*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):	0.74	

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)
1.5	10	4.77	0.838	0.49	6.91	-102.4	15.05	16.62
2.25	15	4.60	0.842	0.45	6.90	-104.6	12.96	16.62
3	20	4.59	0.846	0.45	6.90	-107.7	7.36	16.62
3.75	25	4.58	0.850	0.45	6.90	-109.2	7.28	16.63
4.5	30	4.58	0.852	0.41	6.90	-109.4	6.97	16.63

UB

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) SLIGHT Odor: Yes / No STRONG Notes/Comments: TUBING HAS BLACK STAINING

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~ FUEL ODOR

Laboratory Analyses (Circle): VOC, VOC-LL, ~~DRO~~, ~~RRO~~, Methane, Dissolved Metals*, (Sulfate), Alkalinity, Ammonia as N, Nitrate/Nitrite as N (Fe/Mn)

pH checked of samples: (Y) N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: ~~4~~ 5.5 Containerized and disposed as IDW? (Yes) / No If No, why not?

Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: UB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/15/19 | **Probe/Well #:** MW35

Time: 15:20 | **Sample ID:** 19FWOU6 26 WG

Sampler: MiKayla Daigle

Weather: Sunny | **Outside Temperature:** 71°F

QA/QC Sample ID/Time/LOCID: 2 | **MS/MSD Performed? Yes/ (No)**

Purge Method: Peristaltic Pump / (Submersible) Bladder | **Sample Method:** Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 19.10

Depth to Water from TOC (feet): - 14.70

Column of Water in Probe/Well (feet): = 4.40

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

Volume of Water in 1 Probe/Well Casing (gal): 0.72

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 16.70 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.10	10	5.82	0.958	0.53	6.76	119.9	5.95	14.80
1.65	15	6.11	0.958	0.68	6.82	116.0	5.10	14.80
2.20	20	6.73	0.959	0.74	6.81	114.7	4.41	14.80
2.75	25	6.45	0.959	0.79	6.81	113.5	5.06	14.80
3.30	30	6.34	0.960	0.74	6.79	111.9	——	14.80

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

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

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

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

Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) / N **Comments:**

Sheen: Yes / (No) **Odor:** Yes / (No) **Notes/Comments:**

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: (Y) / N **Approximate volume added (mL):** HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 4 Containerized and disposed as IDW: (Yes) / No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 **Site Location:** Former Communications Site

Date: 5/14/19 **Probe/Well #:** MW37

Time: 11:50 **Sample ID:** 19FWOU6 19 WG

Sampler: Mikayla Daigle

Weather: Cloudy **Outside Temperature:** 50°F

QA/QC Sample ID/Time/LOCID: — **MS/MSD Performed? Yes/(No)**

Purge Method: Peristaltic Pump / (Submersible) / Bladder **Sample Method:** Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 **Turbidity Meter #:** 14 **Water Level:** 15

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): 19.75

Depth to Water from TOC (feet): - 16.03

Column of Water in Probe/Well (feet): = 3.72

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

Volume of Water in 1 Probe/Well Casing (gal): 0.61

Sampling Depth

Well Screened (Across) / Below water table Screened 9.7-19.7 btoc

Depth tubing / pump intake set* approx. 18.03 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.50	10	10.17	0.597	1.05	7.03	68.8	3.17	16.12
2.25	15	10.09	0.599	0.85	7.00	69.0	3.19	16.15
3.00	20	10.12	0.600	0.73	7.00	67.4	2.97	16.15
3.75	25	10.26	0.598	0.70	7.01	66.9	3.16	16.15

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 (Slightly yellow) / Yellow / Orange / Brown/Black (Sand/Silt) / Other: —

Well Condition: Locked (Y) / N **Labeled with LOC ID:** (Y) / N **Comments:** —

Sheen: Yes / (No) **Odor:** Yes / (No) **Notes/Comments:** —

* Dissolved metals include iron, manganese, ~~phosphorous and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, (DRO), (RRO), Methane, (Dissolved Metals*), (Sulfate), Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: (Y) N **Approximate volume added (mL):** HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 5.5 Containerized and disposed as IDW: (Yes) / No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/14/19 | **Probe/Well #:** MW39

Time: 14:50 | **Sample ID:** 19FWOU6 21 WG

Sampler: Mikayla Daigle

Weather: Mostly cloudy | **Outside Temperature:** 58°F

QA/QC Sample ID/Time/LOCID: ——— | **MS/MSD Performed? Yes/ No**

Purge Method: Peristaltic Pump / Submersible / Bladder | **Sample Method:** Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 19.80

Depth to Water from TOC (feet): - 15.40

Column of Water in Probe/Well (feet): = 4.40

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

Volume of Water in 1 Probe/Well Casing (gal): 0.72

Sampling Depth

Well Screened Across / Below water table Screened 9.8-19.8 btoc

Depth tubing / pump intake set* approx. 17.40 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)
1.25	10	5.44	0.817	1.65	6.94	-44.3	27.00	15.50
1.88	15	5.22	0.811	1.26	6.97	-46.3	11.94	15.50
2.51	20	5.14	0.807	1.06	6.98	-47.0	8.37	15.50
3.14	25	4.89	0.807	0.90	7.00	-48.3	8.17	15.50
3.77	30	5.14	0.805	0.84	6.99	-48.6	5.53	15.50
4.40	35	4.89	0.806	0.77	7.00	-49.0	5.52	15.50
5.03	40	5.15	0.804	0.74	7.00	-49.3	4.90	15.50
5.66	45	4.75	0.804	0.69	7.00	-49.2	4.77	15.50
6.30	50	4.83	0.805	0.70	7.01	-49.6	4.26	15.50

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:** ———

* Dissolved metals include iron, manganese, ~~phosphorus~~, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: Y / N **Approximate volume added (mL):** HCl = ——— HNO$_3$ = ———

Purge Water

Gallons generated: 7 Containerized and disposed as IDW? Yes / No If No, why not?

Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-21 | Site Location: Former Communications Site
Date: 5/13/19 | Probe/Well #: MW39
Time: 1220 | Sample ID: 19FWOU607 WG
Sampler: CB
Weather: MOSTLY CLOUDY | Outside Temperature: 55°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 # 7 | Turbidity Meter #: 12 | Water Level: 13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —
Column of Water in Probe/Well | Sampling Depth: 20' SCREEN

Total Depth in Probe/Well (feet btoc): 31.99
Depth to Water from TOC (feet): - 17.05
Column of Water in Probe/Well (feet): = 14.94
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): 2.43

Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 19 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	6.10	0.574	0.70	7.23	-97.7	64.08	17.08
2.25	15	6.02	0.572	0.67	7.22	-100.3	45.13	17.08
3	20	5.85	0.571	0.66	7.21	-102.6	30.41	17.08
3.75	25	5.95	0.567	0.62	7.22	-103.7	20.67	17.09
4.5	30	6.05	0.567	0.60	7.22	-105.7	14.98	17.09
5.25	35	6.02	0.567	0.60	7.23	-105.5	7.78	17.09
5.5								
				CB				

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:
* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, (VOC-LL), DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N
pH checked of samples: Y/N Approximate volume added (mL): HCl = X HNO3 = X

Purge Water
Gallons generated: 5.5 Containerized and disposed as IDW? (Yes) / No If No, why not?
Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/13/19 | Probe/Well #: MW47

Time: 10:50 | Sample ID: 19FWOU6 01 WG

Sampler: MiKayla Daigle

Weather: Cloudy | Outside Temperature: 50°F

QA/QC Sample ID/Time/LOCID: 19FWOU602WG / 11:05 / [redacted] MW471 | MS/MSD Performed? (Yes) No

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: 15

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): 19.80

Depth to Water from TOC (feet): - 16.71

Column of Water in Probe/Well (feet): = 3.09

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

Volume of Water in 1 Probe/Well Casing (gal): 0.50

Sampling Depth

Well Screened (Across) / Below water table Screened 9.8-19.8 btoc

Depth tubing / pump intake set* approx. 18.71 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	4.27	0.656	2.12	7.01	162.9	4.04	16.85
2.25	15	4.48	0.656	1.70	7.04	157.0	4.86	16.80
3.0	20	4.55	0.655	1.38	7.03	152.6	3.23	16.80
3.75	25	4.52	0.657	1.15	7.06	148.8	3.19	16.80
4.50	30	4.50	0.660	1.01	7.12	144.1	3.24	16.80

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

Did drawdown stabilize? (Yes) No If no, why not?

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

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

Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) / N Comments:

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

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC (VOC-LL) DRO, RRO, (Methane) (Dissolved Metals*) (Sulfate) (Alkalinity) (Ammonia as N) (Nitrate/Nitrite as N)

pH checked of samples: (Y) N Approximate volume added (mL): HCl = X HNO3 = 0

Purge Water

Gallons generated: 10.5 Containerized and disposed as IDW? (Yes) No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/13/19 | **Probe/Well #:** MW49

Time: 15:05 | **Sample ID:** 19FWOU6 04 WG

Sampler: Mikayla Daigle

Weather: Partly cloudy | **Outside Temperature:** 62°F

QA/QC Sample ID/Time/LOCID: — | **MS/MSD Performed? Yes/ No**

Purge Method: Peristaltic Pump / ~~Submersible~~ / Bladder | **Sample Method:** Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 20.30

Depth to Water from TOC (feet): - 16.72

Column of Water in Probe/Well (feet): = 3.58

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): 0.58

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 18.72 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.50	10	4.71	0.851	2.48	6.91	126.7	5.88	16.99
2.25	15	4.96	0.848	2.33	6.98	104.9	6.20	17.00
3.00	20	5.10	0.846	2.30	6.93	90.6	5.33	17.00
3.75	25	4.88	0.844	2.30	6.95	77.0	4.81	17.00
4.50	30	4.72	0.842	2.26	6.95	67.6	4.39	17.00

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

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

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

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

Well Condition: Locked Y / N | Labeled with LOC ID: Y / N | **Comments:** —

Sheen: Yes / No | **Odor:** Yes / No | **Notes/Comments:** —

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-L, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: Y / N | **Approximate volume added (mL):** HCl = X | HNO_3 = 0

Purge Water

Gallons generated: 5.5 | Containerized and disposed as IDW? Yes / No | If No, why not?

Disposal method*: POL Water / CERCLA Waste | * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/16/19 | Probe/Well #: MW58

Time: 0840 | Sample ID: 19FWOU6 27 WG

Sampler: CB

Weather: SUNNY | Outside Temperature: 56°F

QA/QC Sample ID/Time/LOCID: 19FWOU628WG / 0855 / MW581 | 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 #: 12 | Water Level: 13

Free Product Observed in Probe/Well? Yes / (No) | If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 18.29

Depth to Water from TOC (feet): - 13.82

Column of Water in Probe/Well (feet): = 5.01

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

Volume of Water in 1 Probe/Well Casing (gal): 0.82

Sampling Depth

Well Screened (Across) Below water table

Depth tubing / pump intake set* approx. 15.8 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	4.50	0.574	1.41	7.06	-69.8	256.7	13.90
2.25	15	4.55	0.572	0.99	7.01	-71.5	155.6	13.92
3	20	4.61	0.571	0.84	7.06	-72.1	97.21	13.92
3.75	25	4.55	0.569	0.70	7.04	-70.7	50.00	17.92
4.5	30	4.53	0.568	0.70	7.04	-69.9	37.28	13.92
5.25	35	4.50	0.568	0.68	7.04	-67.2	39.64	13.92
6	40	4.52	0.568	0.70	7.04	-68.9	20.16	17.92
6.75	45	4.52	0.568	0.68	7.03	-67.6	18.52	17.92
			CB					

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: FLUSH MOUNT

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

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, (DRO), RRO, Methane, (Dissolved Metals), (Sulfate), Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: (Y) N | Approximate volume added (mL): HCl = 0 | HNO3 = 0

Purge Water

Gallons generated: 7 | Containerized and disposed as IDW? (Yes) / No | If No, why not?

Disposal method*: POL Water / (CERCLA Waste) | * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/15/19 | **Probe/Well #:** MW61

Time: 12:20 | **Sample ID:** 19FWOU623WG

Sampler: Mikayla Daigle

Weather: Sunny | **Outside Temperature:** 62°F → VOC only

QA/QC Sample ID/Time/LOCID: 19FWOU624WG / 12:30 / MW611 | **MS/MSD Performed?** (Yes)/No -- For VOC only

Purge Method: Peristaltic Pump / (Submersible) / Bladder | **Sample Method:** Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 20.20

Depth to Water from TOC (feet): - 15.48

Column of Water in Probe/Well (feet): = 4.72

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

Volume of Water in 1 Probe/Well Casing (gal): 0.77

Sampling Depth

Well Screened (Across) / Below water table — Screened 10.1-20.1 btoc

Depth tubing / pump intake set* approx. 17.48 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.25	10	6.40	0.630	0.65	7.06	-62.6	82.76	15.58
1.88	15	6.08	0.632	0.55	7.05	-64.5	50.46	15.62
2.51	20	6.11	0.632	0.51	7.05	-65.8	26.03	15.64
3.14	25	6.44	0.633	0.48	7.06	-67.4	20.27	15.64
3.77	30	6.66	0.634	0.45	7.07	-68.3	20.08	15.64
4.40	35	6.41	0.635	0.43	7.07	-69.2	16.70	15.64
5.03	40	6.43	0.634	0.43	7.06	-69.4	20.42	15.64

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: Eventually ran clear

Well Condition: Lock: (Y) / N | Labeled with LOC ID: (Y) / N | **Comments:**

Sheen: Yes / (No) | **Odor:** Yes / (No) | **Notes/Comments:**

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): (VOC), VOC-LL, DRO, RRO, Methane, (Dissolved Metals), (Sulfate), Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: (Y) / N | **Approximate volume added (mL):** HCl = X | HNO_3 = 0

Purge Water

Gallons generated: 7 | Containerized and disposed as IDW? (Yes) / No | If No, why not?

Disposal method*: POL Water / (CERCLA Waste) | * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/14/16 | Probe/Well #: MW62

Time: 1200 | Sample ID: 19FWOU6 13 WG

Sampler: CB

Weather: CLOUDY | Outside Temperature: 51°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 # 7 | Turbidity Meter #: 12 | Water Level: 13

Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: ———

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 20.16

Depth to Water from TOC (feet): - 14.76

Column of Water in Probe/Well (feet): = 5.4

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

Volume of Water in 1 Probe/Well Casing (gal): 0.88

Sampling Depth

Well Screened ~~Across~~ / **Below** water table

Depth tubing / pump intake set* approx. 16.7 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.

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)
1.5	10	5.52	1.055	0.71	6.74	172.3	9.86	14.91
2.25	15	5.50	1.057	0.66	6.73	167.2	7.02	14.92
3	20	5.49	1.060	0.64	6.73	165.0	6.72	14.93
3.75	25	5.45	1.062	0.62	6.73	164.7	3.98	14.93
4.5	30	5.45	1.062	0.63	6.73	165.1	3.55	14.93
			CB					

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: ———

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, (DRO), (RRO), Methane, Dissolved Metals* (Sulfate), Alkalinity, Ammonia as N, Nitrate/Nitrite as N Fe/Mn

pH checked of samples: (Y) N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

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

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 **Site Location:** Former Communications Site

Date: 5/16/19 **Probe/Well #:** MW64

Time: 10:30 **Sample ID:** 19FWOU630 WG

Sampler: M. Kayla Daigle

Weather: Sunny **Outside Temperature:** 62°F

QA/QC Sample ID/Time/LOCID: — **MS/MSD Performed? Yes/ No**

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

Equipment Used for Sampling: YSI # 9 **Turbidity Meter #:** 14 **Water Level:** 15

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): 20.05

Depth to Water from TOC (feet): - 15.30

Column of Water in Probe/Well (feet): = 4.75

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

Volume of Water in 1 Probe/Well Casing (gal): 0.77

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 17.30 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)
1.50	10	5.39	0.506	0.64	7.10	-6.0	24.79	15.40
2.25	15	5.74	0.501	0.56	7.14	-20.0	17.47	15.48
3.00	20	5.16	0.499	0.57	7.14	-27.3	10.96	15.48
3.75	25	5.64	0.499	0.48	7.17	-33.7	12.14	15.48
4.50	30	5.75	0.499	0.47	7.18	-37.4	9.37	15.48

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

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

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

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

Well Condition: Locked Y / N Labeled with LOC ID: Y / N **Comments:** —

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

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, ~~Sulfate~~, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: Y / N **Approximate volume added (mL):** HCl = 0 HNO$_3$ = 0

Purge Water

Gallons generated: 6.5 Containerized and disposed as IDW? Yes / No If No, why not?

Disposal method*: POL Water / ~~CERCLA Waste~~ * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/15/19 | **Probe/Well #:** MW77

Time: 1535 | **Sample ID:** 19FWOU622 WG

Sampler: CB

Weather: PARTLY CLOUDY | **Outside Temperature:** 72°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:** 13

Free Product Observed in Probe/Well? Yes/No | **If Yes, Depth to Product:** 18.58

Column of Water in Probe/Well | **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 22.60 | Well Screened **Across** / **Below** water table

Depth to Water from TOC (feet): - 18.61 | Depth tubing / pump intake set* approx. 19.6 feet below top of casing

Column of Water in Probe/Well (feet): = 3.99 | *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): 0.65 X 3 = 1.95

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
DID NOT COLLECT PARAMETERS DUE TO THE PRESENCE OF PRODUCT. REMOVED 3 CASING VOLUMES THEN COLLECTED SAMPLE. MADE SURE PRODUCT DID NOT DRAW DOWN INTO SAMPLE.								

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

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

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

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

Well Condition: Locked / N | Labeled with LOC ID: / N | **Comments:**

Sheen: Yes / No PRODUCT **Odor:** Yes / No | **Notes/Comments:**

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: Y / N | **Approximate volume added (mL):** HCl = — HNO3 = —

Purge Water

Gallons generated: 2 | Containerized and disposed as IDW? Yes / No | If No, why not?

Disposal method*: POL Water / CERCLA Waste | * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/13/19 | Probe/Well #: MW 78

Time: 1400 | Sample ID: 19FWOU6 08 WG

Sampler: CB

Weather: CLOUDY | Outside Temperature: 61 °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 # 7 | Turbidity Meter #: 12 | Water Level: 13

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

Column of Water in Probe/Well | Sampling Depth: 10' SCREEN

Total Depth in Probe/Well (feet btoc): 37.20

Depth to Water from TOC (feet): - 17.28

Column of Water in Probe/Well (feet): = 19.92

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): 3.24

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 32 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)
1.5	10	5.76	0.525	0.64	7.26	-95.3	128	17.32
2.25	15	6.47	0.524	0.47	7.27	-103.0	82.42	17.32
3	20	6.23	0.524	0.43	7.27	-104.4	63.60	17.32
3.75	25	6.21	0.525	0.43	7.28	-106.7	28.21	17.32
4.5	30	6.15	0.526	0.39	7.26	-108.1	15.96	17.32
5.25	35	6.13	0.527	0.37	7.26	-109.7	17.02	17.32
6	40	6.15	0.527	0.37	7.26	-110.0	13.21	17.32

CB

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:

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, ~~VOC-LL~~, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: Y N Approximate volume added (mL): HCl = X HNO3 = X

Purge Water

Gallons generated: 6 ~~Containerized~~ and disposed as IDW? Yes / No If No, why not?

Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site
Date: 5/13/19 | Probe/Well #: MW79
Time: 16:45 | Sample ID: 19FWOU6 05 WG
Sampler: Mikayla Daigle
Weather: Mostly sunny | Outside Temperature: 62°F
QA/QC Sample ID/Time/LOCID: — | MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump / Submersible / Bladder | Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: 15
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): 21.55
Depth to Water from TOC (feet): - 19.77
Column of Water in Probe/Well (feet): = 1.78
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 0.45

Sampling Depth

Well Screened Across / Below water table
Depth tubing / pump intake set* approx. 20.77 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)
1.2	10	5.45	0.604	1.26	7.04	-19.9	119.4	18.81
1.8	15	5.42	0.610	1.08	7.06	-33.8	113.8	18.89
2.4	20	4.41	0.619	0.86	7.08	-47.7	9.61	18.82
3.0	25	4.48	0.622	0.84	7.09	-53.6	4.13	18.82
3.6	30	4.66	0.623	0.82	7.10	-55.8		

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 eventually Yellow / Orange initially / Brown/Black (Sand/Silt) Other: Started orange; ran clear
Well Condition: Lock: Y / N Labeled with LOC ID: Y / N Comments:
Sheen: Yes / No Odor: Yes / No Notes/Comments:
* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~
Laboratory Analyses (Circle): VOC, VOC-11, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N
pH checked of samples: Y / N Approximate volume added (mL): HCl = X HNO3 = Ø

Purge Water

Gallons generated: 7.5 Containerized and disposed as IDW: Yes / No If No, why not?
Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site
Date: 5/15/19 | **Probe/Well #:** MW80
Time: 13:45 | **Sample ID:** 19FWOU6 25 WG
Sampler: Mikayla Daigle
Weather: Sunny | **Outside Temperature:** 68°F
QA/QC Sample ID/Time/LOCID: — | **MS/MSD Performed? Yes/ No**

Purge Method: Peristaltic Pump / Submersible / Bladder | **Sample Method:** Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15
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): 46.80
Depth to Water from TOC (feet): - 15.00
Column of Water in Probe/Well (feet): = 31.80
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): 5.18

Sampling Depth
Well Screened Across / Below water table Screened 36.8-46.8 btoc
Depth tubing / pump intake set* approx. 41.8 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.0	10	7.52	0.403	0.46	7.28	-97.0	85.41	15.01
1.5	15	6.97	0.405	0.38	7.29	-97.7	77.92	15.01
2.0	20	7.74	0.406	0.35	7.31	-99.3	49.69	15.01
2.5	25	7.15	0.406	0.31	7.30	-99.3	42.58	15.01
3.0	30	6.86	0.406	0.30	7.31	-99.5	30.49	15.01
3.5	35	6.99	0.404	0.28	7.33	-99.4	41.28	15.01
4.0	40	6.67	0.405	0.23	7.32	-100.4	22.72	15.01
4.5	45	6.56	0.405	0.24	7.33	-100.4	23.56	15.01

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 / brown / black tint / Yellow / Orange / Brown/Black (Sand/Silt) / Other:
Well Condition: Locked Y / N | Labeled with LOC ID Y / N | **Comments:**
Sheen: Yes / No | **Odor:** Yes / No | **Notes/Comments:**

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N
pH checked of samples: Y / N | **Approximate volume added (mL):** HCl = 0 HNO3 = 0

Purge Water
Gallons generated: 5.75 | Containerized and disposed as IDW? Yes / No | If No, why not?
Disposal method*: POL Water / CERCLA Waste | * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | **Site Location:** Former Communications Site

Date: 5/14/19 | **Probe/Well #:** MW82

Time: 13:00 | **Sample ID:** 19FWOU6 20 WG

Sampler: Mikayla Daigle

Weather: Partly Sunny | **Outside Temperature:** 53°F

QA/QC Sample ID/Time/LOCID: | **MS/MSD Performed? Yes/(No)**

Purge Method: Peristaltic Pump / (Submersible) / Bladder | **Sample Method:** Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** 15

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): 21.75

Depth to Water from TOC (feet): - 18.02

Column of Water in Probe/Well (feet): = 3.73

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

Volume of Water in 1 Probe/Well Casing (gal): 0.61

Sampling Depth

Well Screened (across) / Below water table Screened 11.7-21.7 btoc

Depth tubing / pump intake set* approx. 20.02 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)
1.50	10	6.23	0.863	0.78	6.69	113.2	3.29	18.05
2.25	15	6.59	0.866	0.70	6.72	107.9	4.42	18.05
3.00	20	6.42	0.870	0.72	6.71	105.2	4.20	18.10
3.75	25	6.58	0.872	0.68	6.72	102.0	3.80	18.10

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

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

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

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

Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) / N **Comments:**

Sheen: Yes / (No) **Odor:** Yes / (No) **Notes/Comments:**

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, VOC-LL, (DRO, RRO), Methane, (Dissolved Metals*), (Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N)

pH checked of samples: (Y) N **Approximate volume added (mL):** HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 5 Containerized and disposed as IDW? (Yes) / No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 **Site Location:** Former Communications Site

Date: 5/13/19 **Probe/Well #:** MW91

Time: 1100 **Sample ID:** 19FWOU6 06 WG

Sampler: ~~Cloudy~~ CB

Weather: CLOUDY **Outside Temperature:** 51 °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 # 7 **Turbidity Meter #:** 12 **Water Level:** 13

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

Column of Water in Probe/Well **Sampling Depth** 20' SCREEN

Total Depth in Probe/Well (feet btoc): 76.13 Well Screened **Across** / **Below** water table

Depth to Water from TOC (feet): - 17.48 Depth tubing / pump intake set* approx. 56 feet below top of casing

Column of Water in Probe/Well (feet): = 58.65 *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): 9.6

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.

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)
0.16 ~~0.33~~	10	5.36	0.427	1.03	7.33	-110.7	5.38	17.48
0.49 ~~0.99~~	15	5.45	0.428	0.84	7.33	-117.4	1.24	17.48
1.32	20	5.41	0.428	0.77	7.33	-119.7	0.59	17.48
1.66	25	5.40	0.428	0.75	7.33	-120.0	0.70	17.48
1.2	30	5.41	0.428	0.73	7.33	-120.2	0.69	17.48
				CB				

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

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

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

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

Well Condition: Locked Y / N Labeled with LOC ID: Y / N **Comments:** —

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

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, ~~VOC-LL~~, DRO, RRO, Methane, ~~Dissolved Metals~~*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: ~~Y~~ N **Approximate volume added (mL):** HCl = X HNO = X

Purge Water

Gallons generated: 2 Containerized and disposed as IDW? Yes / No If No, why not?

Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-21 | Site Location: Former Communications Site

Date: 5/14/19 | Probe/Well #: MW93

Time: 10:20 | Sample ID: 19FWOU6 18 WG

Sampler: MiKayla Daigle

Weather: Cloudy | Outside Temperature: 44°F

QA/QC Sample ID/Time/LOCID: — | MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: 15

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): 72.60

Depth to Water from TOC (feet): - 17.48

Column of Water in Probe/Well (feet): = 55.12

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

Volume of Water in 1 Probe/Well Casing (gal): 8.98

Sampling Depth

Well Screened Across / (Below) water table — Screened 52.7 - 72.7 btoc

Depth tubing / pump intake set* approx. 62.7 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.

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.28	10	5.86	0.420	1.01	7.44	-98.0	4.61	17.50
1.92	15	5.90	0.420	0.77	7.50	-109.3	3.56	17.50
2.56	20	5.98	0.420	0.60	7.53	-113.6	3.45	17.50
3.20	25	5.86	0.419	0.49	7.56	-116.7	2.88	17.50

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) (Slight) Notes/Comments: —

* Dissolved metals include iron, manganese, ~~phosphorus, and potassium~~

Laboratory Analyses (Circle): VOC, (VOC-LL), DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia as N, Nitrate/Nitrite as N

pH checked of samples: X / N Approximate volume added (mL): HCl = X HNO3 = X

Purge Water

Gallons generated: 4 Containerized and disposed as IDW? (Yes) / No If No, why not?

Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: MD

Submersible Pump Equipment Blank

Rinsate #: 1

Sample ID: 19FWDUGEB01WQ

Date: 5/13/19

Time: 1840

Analysis: DRO / RRO / LL-VOC / SO4 / Fe / Mn

Well that the pump was last used on: MW32-R

Submersible Pump Equipment Blank

Rinsate #: 2

Sample ID: 19EW006EB02WQ

Date: 5/14/19

Time: 1610

Analysis: DRO/RRO, Fe/Mn, SO4

Well that the pump was last used on: MW33

Submersible Pump Equipment Blank

Rinsate #: 3

Sample ID: 19FW0V6EB03WQ

Date: 5/15/19

Time: 1725

Analysis: VOC

Well that the pump was last used on: MW61

OU6 FT. WAINWRIGHT
5/13/19 + IC's
0730 - SHOP - GWS PREP
0940 - ARRIVE AT THANANA TRAILS. 1100 - GWS MW91 1220 - GWS MW39. 1400 - GWS MW78. 1530/1545 - GWS MW32R + DUPLICATE + MSMSD. 1705 - GWS MW13 CLEAN UP. 1725 - LEAVE SITE. 1745 - SHOP - CLEAN UP + RINSATE #1 AT 1840 1900 - END OF DAY.

Ch Boca

5/14/19
0730 - SHOP - GWS PREP. STOP BY HOME DEPOT. 0905 ON SITE. 1020 - GWS MW28 1200 - GWS MW67. 1325 GWS MW33 + MSMSD + DUPLICATE (DUP AT 1340) 1500 - GWS MW12R. - CLEAN UP - LEAVE SITE AT 1615 - 1535 - SHOP - CLEAN UP PREP FOR 5/15. (WORK ON OU3 RINSATE 2 AT 1610 FIGURES)

5/14 CONT.
END OF DAY 1800,
Ch Boca

5/15/19
0730 - SHOP - GWS PREP (WORK ON 2-PTY + SCK WP FIGS ~~TO~~ FROM 0830-1130). 1130 - 1430 - PACK/SHIP FIRST OU6 SHIPMENT. 1430 - ARRIVE AT OU6 - THANANA TRAILS - MEET WITH MIKAYLA (BRICE) - PIC. 1535 - GWS MW77 → + DUMP DEION WATER. + CLEAN UP. 1620 - LEAVE SITE. 1640 SHOP. CLEAN UP + RINSATE #3 AT 1725, 1745 - END OF DAY. Ch Boca
5/16/19
0630 - SHOP - GWS PREP
0720 - ONSITE - LOCATE MW58. 0840/0855 - GWS MW58 + DUP - CLEAN UP FINISH ICS
1130 - SHOP - CLEAN UP. 1200 E.O.D. Ch Boca

18 OU6 Fort Wainwright (FW) 5/13/19

Crew: Mikayla Daigle

0800 - Arrive at FES; load vans and develop sampling plan for the day

0915 - Depart FES for FW

1050 - Sample MW47 for VOC-LL, methane, dis metals, sulfate, alkalinity, ammonia, and nitrate/nitrite as N. ~~1200~~ Perform duplicate sampling and MS/MSD sampling.

1200 - Cleanup at MW47

1340 - Sample MW08 for VOC-LL, methane, dis. metals, sulfate, alkalinity, ammonia and nitrate/nitrate as N.

1350 - Dumped all sample jars for methane, alkalinity, ammonia, and nitrate in IDW; no longer collecting those samples.

1505 - Sampled MW48 for VOC-LL, diss. metals, and sulfate

1645 - Sampled MW79 for VOC-LL, diss. metals and sulfate

1710 - Depart FW

1725 - Arrive at FES; unload and store samples

1745 - End of day

MD

OU6 Fort Wainwright (FW) 5/14/19 19

Crew: Mikayla Daigle

0810 - Arrive at FES; load van with sampling supplies

0840 - Depart FES for FW

0900 - Arrive at OU6 well MW93. The well is behind a fence and is accessed by walking alongside train tracks and fenceline

1020 - Sample MW93 for VOC-LL

1150 - Sample MW37 for DRO/RRO, dissolved metals and sulfate

1300 - Sample MW82 for DRO, RRO, diss metals and sulfate

1450 - Sample MW38 for DRO/RRO, diss. metals, and sulfate

1350 - Unable to sample MW77 with small clip pump. Detected very strong odor

1615 - Arrive back at FES, unload van

1645 - End of day.

MD

OU6 Fort Wainwright (FW) 5/15/19

Crew: Mikayla Daigle

0800 - Arrive at FES warehouse; load vans

0900 - Depart FES for FW and proceed to OU6 site.

0930 - Setup on MW03

1015 - Sample MW03 for DRO/RRO, dissolved metals, and sulfate

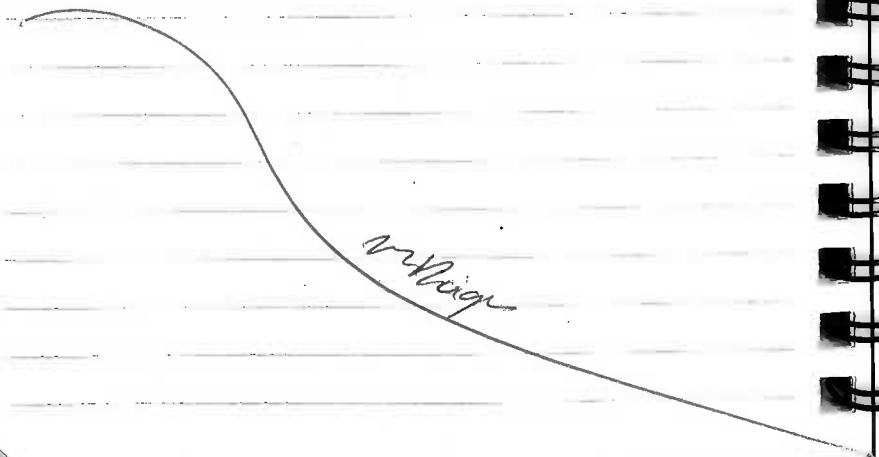
1220 - Sample MW61 for VOC, dissolved metals and sulfate. Performed duplicate and MS/MSD sampling for VOCs only.

1345 - Sample MW80 for VOCs, dissolved metals, and sulfate

1520 - Sample MW35 for DRO/RRO, sulfate, and dissolved metals

1610 - Arrived at FES; unloaded samples

1630 - End of day.



OU6 Fort Wainwright (FW) 5/16/19

Crew: Mikayla Daigle

0800 - Arrive at FES; load van with supplies

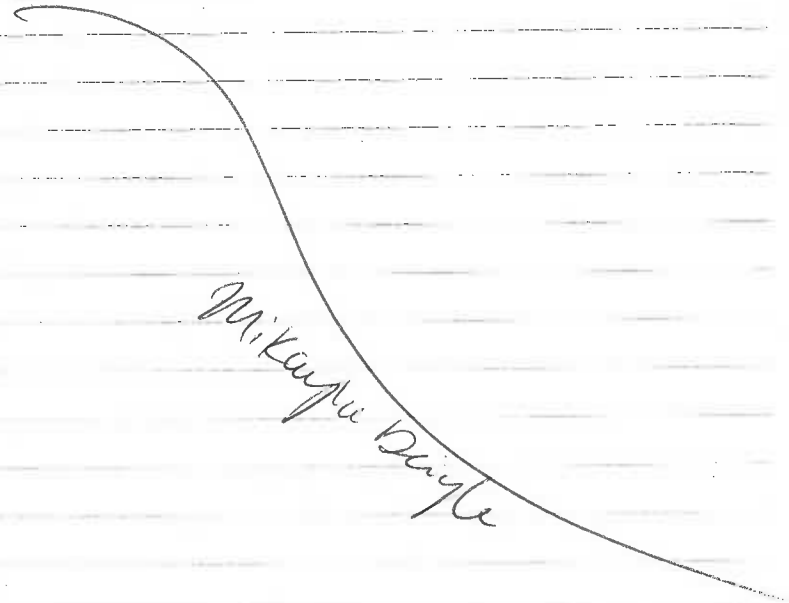
0830 - Depart FES for FW

0845 - Setup on MW06A at OU6 site

0930 - Sample MW06A for DRO/RRO, sulfate, and dissolved metals

1030 - Sample MW64 for DRO/RRO, sulfate, and dissolved metals

1130 - Arrive back at FES; unload van. End of day.



APPENDIX D

PHOTOGRAPHIC LOG

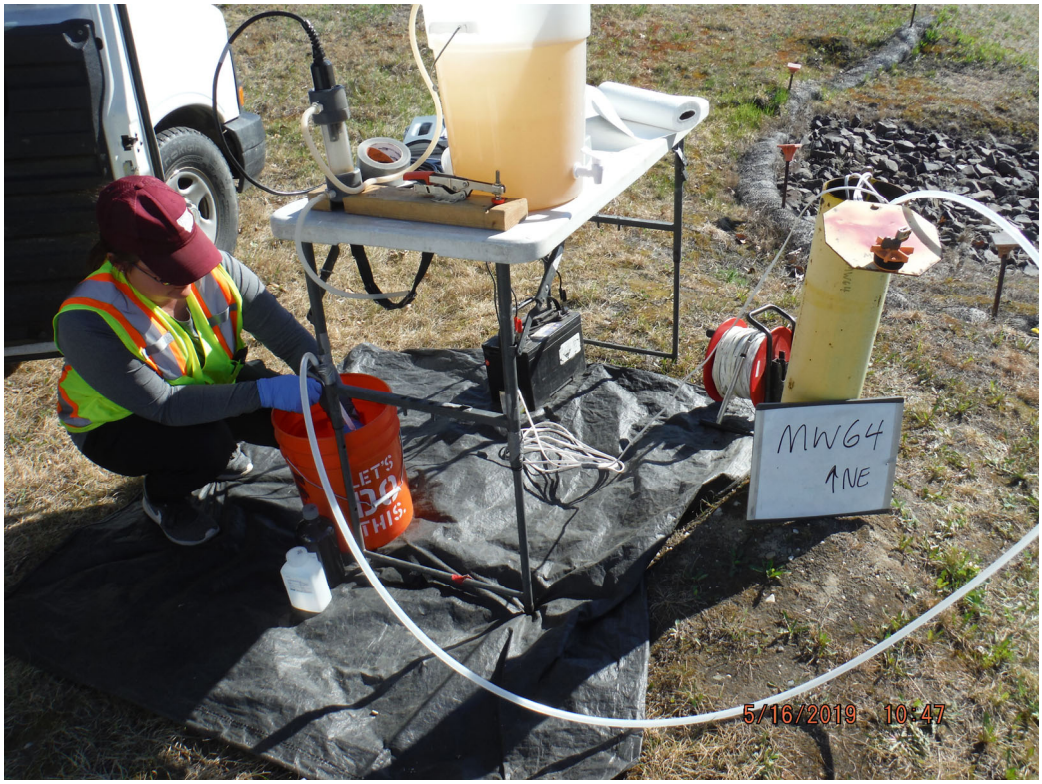
Groundwater sampling of MW-47
(view to West)

Groundwater Sampling of MW-78
(view to West)

Groundwater Sampling of MW-32R
(view to North)

Groundwater Sampling of MW-35
(view to Southwest)

Groundwater Sampling of MW-58
(view to South)



Groundwater Sampling of MW-64
(view to Northeast)

APPENDIX E

MAROS SOFTWARE CONCENTRATION TREND AND PLUME STABILITY RESULTS

Exhibit E-1—Mann-Kendall Trends of Main DRO Plume

MAROS Mann-Kendall Statistics Summary

Project: OU6_2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Time Period: 10/17/2007 **to** 5/16/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PHC as DIESEL FUEL								
MW06A	T	18	18	0.54	10	63.2%	No	NT
MW12R	S	17	17	0.80	-38	93.6%	No	PD
MW33	T	17	17	0.77	58	99.1%	No	I
MW58	T	17	17	0.39	16	72.9%	No	NT
PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP								
MW12R	S	17	11	1.16	-14	70.1%	No	NT
MW33	T	14	11	0.85	60	100.0%	No	I

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

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

Exhibit E-2—Spatial Moment Analysis of Main DRO Plume

MAROS Spatial Moment Analysis Summary

Project: OU6_2019
Location: Fort Wainwright

User Name: FES
State: Alaska

	0th Moment	1st Moment (Center of Mass)			2nd Moment (Spread)		
Effective Date	Estimated Mass (Kg)	Xc (ft)	Yc (ft)	Source Distance (ft)	Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
PHC as DIESEL FUEL							
10/17/2007	4.1E+01	1,380,642	3,959,951	179	7,053	13,153	8
5/20/2008	3.5E+01	1,380,646	3,959,956	181	8,075	18,435	8
10/8/2008	3.9E+01	1,380,663	3,959,903	129	6,988	12,581	8
5/30/2009	2.4E+01	1,380,645	3,959,949	176	7,878	19,829	8
9/21/2009	2.3E+01	1,380,652	3,959,920	149	7,215	12,541	8
7/19/2010	7.5E+01	1,380,647	3,960,031	245	7,956	35,294	9
10/29/2010	7.5E+01	1,380,660	3,959,955	172	6,885	27,873	9
7/14/2011	3.5E+01	1,380,657	3,959,990	204	8,346	18,588	7
10/5/2011	6.8E+01	1,380,668	3,959,898	122	5,151	12,505	7
7/11/2012	4.6E+01	1,380,670	3,959,955	167	6,378	29,457	8
9/26/2012	4.7E+01	1,380,670	3,959,914	133	4,986	19,556	9
5/19/2016	5.5E+01	1,380,635	3,959,948	181	6,536	26,459	10
9/9/2016	7.7E+01	1,380,676	3,959,907	123	6,559	24,560	10
7/20/2017	4.4E+01	1,380,624	3,959,957	195	6,915	29,593	10
9/28/2017	7.0E+01	1,380,619	3,959,940	186	6,509	31,953	10
6/20/2018	6.9E+01	1,380,611	3,959,982	223	7,345	38,086	10
9/26/2018	7.7E+01	1,380,608	3,959,961	209	7,158	31,014	10
5/16/2019	1.5E+02	1,380,614	3,959,943	191	5,885	28,860	10

Exhibit E-2—Spatial Moment Analysis of Main DRO Plume (continued)

Project: OU6_2019
Location: Fort Wainwright

User Name: FES
State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	PHC as DIESEL FUEL	0.50	73	99.7%	I
1st Moment: Distance to Source					
	PHC as DIESEL FUEL	0.20	33	88.5%	NT
2nd Moment: Sigma XX					
	PHC as DIESEL FUEL	0.13	-41	93.4%	PD
2nd Moment: Sigma YY					
	PHC as DIESEL FUEL	0.34	71	99.7%	I

Note: The following assumptions were applied for the calculation of the Zeroth Moment:

Porosity: 0.30 **Saturated Thickness:** Uniform: 30 ft

Mann-Kendall Trend test performed on all sample events for each constituent. Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events).

Note: The Sigma XX and Sigma YY components are estimated using the given field coordinate system and then rotated to align with the estimated groundwater flow direction. Moments are not calculated for sample events with less than 6 wells.

Exhibit E-3 —Uncertainty Results for the Main DRO Plume

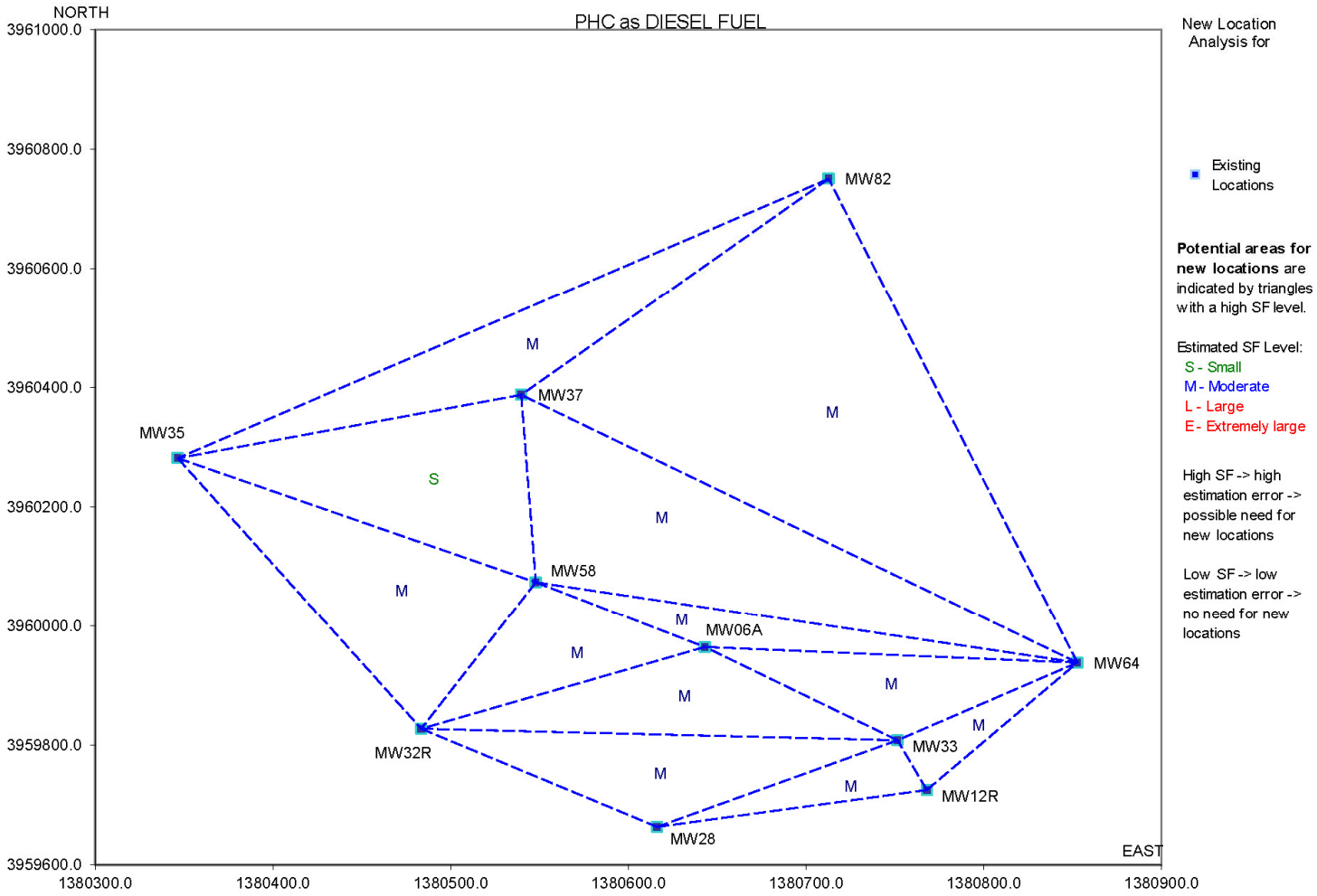


Exhibit E-4—Sample Location Optimization Results for the Main DRO Plume

MAROS Sampling Location Optimization Results

Project: OU6_2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 12 (5/19/2016) **to** Sample Event 18 (5/16/2019)

Parameters used:

Constituent	Inside SF	Hull SF	Area Ratio	Conc. Ratio
PHC as DIESEL FUEL	0.2	0.1	0.8	0.8

Well	X (feet)	Y (feet)	Removable?	Average Slope Factor*	Minimum Slope Factor*	Maximum Slope Factor*	Eliminated?
PHC as DIESEL FUEL							
MW06A	1380643.00	3959965.00	☑	0.250	0.218	0.287	☐
MW12R	1380767.88	3959725.50	☑	0.351	0.017	0.543	☐
MW28	1380616.13	3959663.75	☑	0.400	0.279	0.646	☐
MW32R	1380483.38	3959828.00	☑	0.422	0.290	0.531	☐
MW33	1380751.38	3959808.75	☑	0.541	0.435	0.635	☐
MW35	1380346.38	3960282.00	☑	0.347	0.268	0.525	☐
MW37	1380539.63	3960388.00	☑	0.215	0.029	0.332	☐
MW58	1380547.88	3960074.25	☑	0.241	0.113	0.318	☐
MW64	1380852.63	3959938.75	☑	0.787	0.493	0.874	☐
MW82	1380712.63	3960750.75	☑	0.453	0.212	0.779	☐

Note: The Slope Factor indicates the relative importance of a well in the monitoring network at a given sampling event; the larger the SF value of a well, the more important the well is and vice versa; the Average Slope Factor measures the overall well importance in the selected time period; the state coordinates system (i.e., X and Y refer to Easting and Northing respectively) or local coordinates systems may be used; wells that are NOT selected for analysis are not shown above.
* When the report is generated after running the Excel module, SF values will NOT be shown above.

Exhibit E-5—Sampling Frequency Optimization of Main DRO Plume

MAROS Sampling Frequency Optimization Results

Project: OU6_2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 18

"Recent Period" defined by events: **From** Sample Event 12 (5/19/2016) **To** Sample Event 18 (5/16/2019)

"Rate of Change" parameters used:

Constituent	Cleanup Goal	Low Rate	Medium Rate	High Rate
PHC as DIESEL FUEL	1.5	0.75	1.5	3

Units: Cleanup Goal is in mg/L; all rate parameters are in mg/L/year.

Well	Recommended Sampling Frequency	Frequency Based on Recent Data	Frequency Based on Overall Data
PHC as DIESEL FUEL			
MW06A	Quarterly	Quarterly	Annual
MW12R	Annual	Annual	Annual
MW28	Annual	Annual	Annual
MW32R	Annual	Annual	Annual
MW33	Quarterly	Quarterly	Quarterly
MW35	Annual	Annual	Annual
MW37	Annual	Annual	Annual
MW58	SemiAnnual	SemiAnnual	Annual
MW64	Biennial	Annual	Annual
MW82	Biennial	Annual	Annual

Note: Sampling frequency is determined considering both recent and overall concentration trends. Sampling Frequency is the final recommendation; Frequency Based on Recent Data is the frequency determined using recent (short) period of monitoring data; Frequency Based on Overall Data is the frequency determined using overall (long) period of monitoring data. If the "recent period" is defined using a different series of sampling events, the results could be different.

Exhibit E-6—Mann-Kendall Trends of MW62 and MW77

MAROS Mann-Kendall Statistics Summary

Project: OU6_2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Time Period: 10/17/2007 **to** 5/16/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PHC as DIESEL FUEL								
MW62	S	17	15	2.34	27	85.6%	No	NT
MW77	T	16	16	1.44	21	81.3%	No	NT
PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP								
MW62	S	17	11	2.26	23	81.5%	No	NT
MW77	T	16	10	1.29	-25	85.7%	No	NT

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

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

Exhibit E-7 —Mann-Kendall Results for TCP Plume Wells

MAROS Mann-Kendall Statistics Summary

Project: OU6_2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Time Period: 10/17/2007 **to** 5/16/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
1,2,3-TRICHLOROPROPANE								
MW47	S	16	14	0.58	-44	97.4%	No	D
MW79	T	15	15	0.69	21	83.6%	No	NT

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

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

Exhibit E-8 —Groundwater Statistics Output TCP in MW47

Groundwater Statistics Tool

Data input worksheet

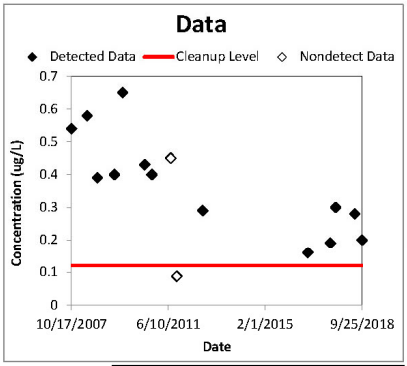
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Remediation
Date of Evaluation	12/2/2019
Person performing analysis	AS

Chemical of Concern	TCP
Well Name/Number	MW47
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	0.12
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	16
Number of detected results:	14
Number of nondetect results:	2
Detection frequency:	0.875

Date (Date)	TCP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
10/17/07	0.5		Yes
5/20/08	0.58		Yes
10/8/08	0.39		Yes
5/30/09	0.4		Yes
9/21/09	0.65		Yes
7/19/10	0.43		Yes
10/29/10	0.4		Yes
7/14/11	0.45	U	No
10/5/11	0.087	U	No
9/26/12	0.29		Yes
9/9/16	0.16		Yes
7/20/17	0.19		Yes
9/28/17	0.3		Yes
6/20/18	0.28		Yes
9/26/18	0.2		Yes
5/13/19	0.31		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

Exhibit E-8 —Groundwater Statistics Output TCP in MW47 (continued)

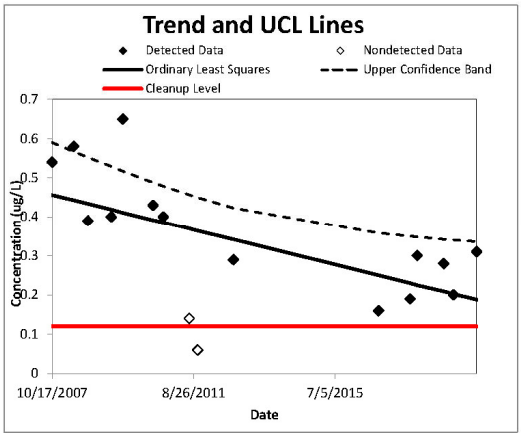
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Remediation
Date of Evaluation	12/2/2019
Person performing analysis	AS

Chemical of Concern	TCP
Well Name/Number	MW47
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	16
Number of detected results	14
Number of non-detected results	2
Detection frequency	88%
Number at or below cleanup level	1
Are any potential outliers present?	No
Mean of concentration	0.343
Standard deviation of concentration	0.153



95% Upper Confidence Limit (UCL)	0.518
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.336
Trend calculation method	Ordinary Least Squares
Cleanup level	0.12
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	Yes

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	TCP Concentration (ug/L)	Data Qualifier	Imputed value*
39372	0.54		0.54
39588	0.58		0.58
39729	0.39		0.39
39963	0.4		0.4
40077	0.65		0.65
40378	0.43		0.43
40480	0.4		0.4
40738	0.45	U	0.14
40821	0.087	U	0.06
41178	0.29		0.29
42622	0.16		0.16
42936	0.19		0.19
43006	0.3		0.3
43271	0.28		0.28
43369	0.2		0.2
43598	0.31		0.31

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	57196.81641

Exhibit E-9 —Groundwater Statistics Output TCP in MW08

Groundwater Statistics Tool
Data input worksheet

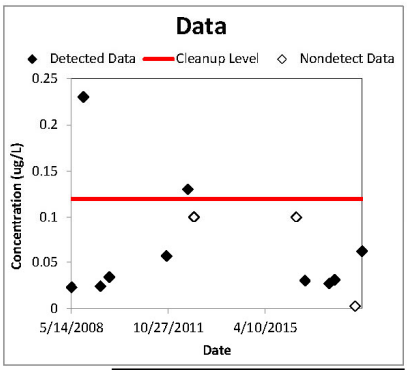
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/2/2019
Person performing analysis	AS

Chemical of Concern	TCP
Well Name/Number	MW08
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	0.12
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	14
Number of detected results:	10
Number of nondetect results:	4
Detection frequency:	0.714285714

Date (Date)	TCP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
5/14/2008	0.023		Yes
10/17/2008	0.23		Yes
5/27/2009	0.024		Yes
9/19/2009	0.034		Yes
10/4/2011	0.057		Yes
7/9/2012	0.13		Yes
9/24/2012	0.1	U	No
5/17/2016	0.1	U	No
9/7/2016	0.03		Yes
7/19/2017	0.027		Yes
9/28/2017	0.031		Yes
6/22/18	0.0025	U	No
9/21/2018	0.062		Yes
5/13/2019	0.0025	U	No



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

Exhibit E-9 —Groundwater Statistics Output TCP in MW08 (continued)

Groundwater Statistics Tool

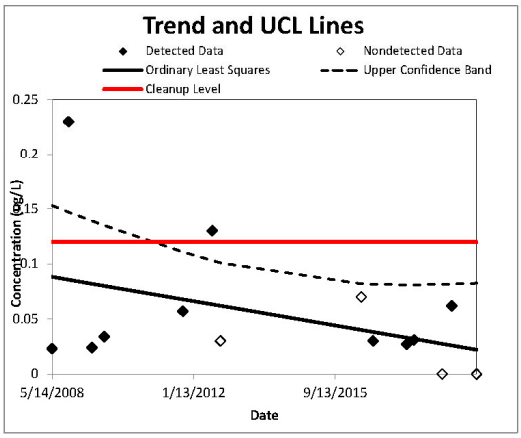
UCL calculations and summary statistics for data sets with nondetects

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/2/2019
Person performing analysis	AS

Chemical of Concern	TCP
Well Name/Number	MW08
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	14
Number of detected results	10
Number of non-detected results	4
Detection frequency	71%
Number at or below cleanup level	12
Are any potential outliers present?	Yes
Mean of concentration	0.0508
Standard deviation of concentration	0.0585

95% Upper Confidence Limit (UCL)	0.123
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.0825
Trend calculation method	Ordinary Least Squares
Cleanup level	0.12
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	Yes



When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	TCP Concentration (ug/L)	Data Qualifier	Imputed value*
39582	0.023		0.023
39738	0.23		0.23
39960	0.024		0.024
40075	0.034		0.034
40820	0.057		0.057
41099	0.13		0.13
41176	0.1	U	0.03
42507	0.1	U	0.07
42620	0.03		0.03
42935	0.027		0.027
43006	0.031		0.031
43273	0.0025	U	0
43364	0.062		0.062
43598	0.0025	U	0

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	57196.81641

Exhibit E-10 —Mann-Kendall Results for TCE Plume Well

MAROS Mann-Kendall Statistics Summary

Project: OU6_2019
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/17/2007 **to** 5/16/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
TRICHLOROETHYLENE (TCE)								
MW61	S	17	17	0.96	-117	100.0%	No	D

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

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

MAROS Version 2,.2 2006, AFCEE Wednesday, November 27, 2019 Page 1 of 1

Exhibit E-11 —Groundwater Statistics Output TCE in MW61

Groundwater Statistics Tool
Data input worksheet

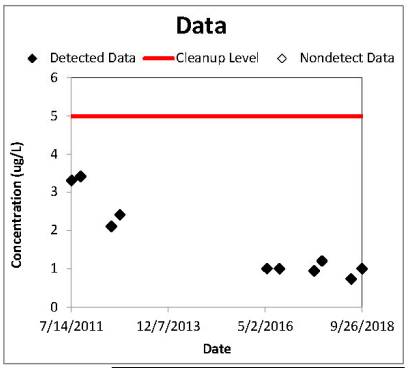
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	11/27/2019
Person performing analysis	AS

Chemical of Concern	TCE
Well Name/Number	MW61
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	5
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	11
Number of detected results:	11
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	TCE Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
7/14/11	3.3		Yes
10/5/11	3.4		Yes
7/11/12	2.1		Yes
9/26/12	2.4		Yes
5/19/16	1		Yes
9/9/16	1		Yes
7/20/17	0.94		Yes
9/28/17	1.2		Yes
6/20/18	0.73		Yes
9/26/18	1		Yes
8/27/19	0.67		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

Exhibit E-11 —Groundwater Statistics Output TCE in MW61 (continued)

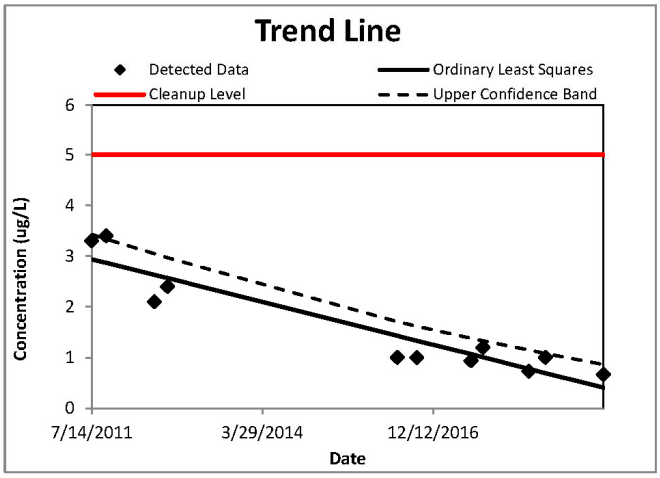
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	11/27/2019
Person performing analysis	AS

Chemical of Concern	TCE
Well Name/Number	MW61
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	11
Number < cleanup level	11
Are any potential outliers present?	No
Mean of concentration	1.61
Standard deviation of concentration	1.02



95% Upper Confidence Limit (UCL)	2.95
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.863
Trend calculation method	Ordinary Least Squares
Cleanup level	5
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	57196.81641
Message: None.	

Exhibit E-12 —Groundwater Statistics Output DRO in MW12R

Groundwater Statistics Tool
Data input worksheet

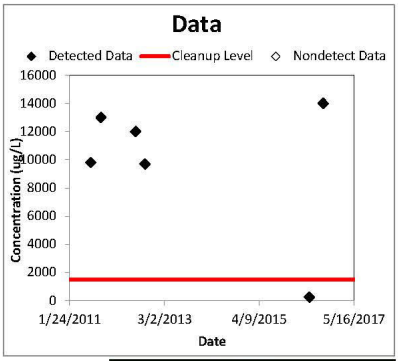
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	11/27/2019
Person performing analysis	AS

Chemical of Concern	DRO
Well Name/Number	MW-12R
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	1500
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	17
Number of detected results:	17
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	DRO Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
5/20/08	6100		Yes
10/8/08	11000		Yes
5/30/09	7430		Yes
9/21/09	5670		Yes
7/19/10	5300		Yes
10/29/10	6500		Yes
7/14/11	9800		Yes
10/5/11	13000		Yes
7/11/12	12000		Yes
9/26/12	9700		Yes
5/19/16	230		Yes
9/9/16	14000		Yes
7/20/17	170		Yes
9/28/17	1600		Yes
6/20/18	760		Yes
9/26/18	290		Yes
5/13/2019	330		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

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Exhibit E-12 —Groundwater Statistics Output DRO in MW12R (continued)

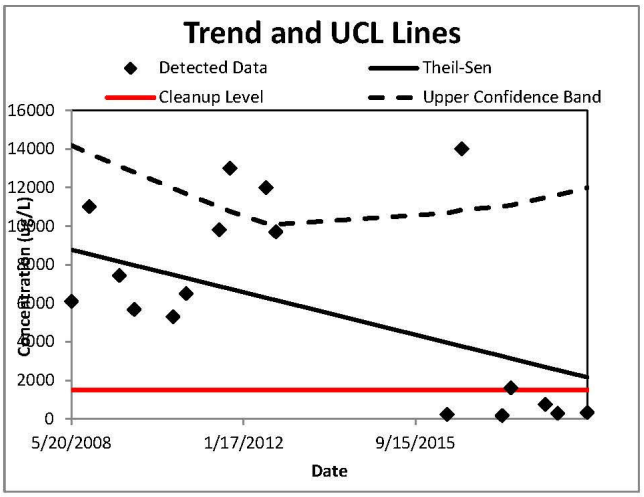
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	11/27/2019
Person performing analysis	AS

Chemical of Concern	DRO
Well Name/Number	MW-12R
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	17
Number < cleanup level	5
Are any potential outliers present?	No
Mean of concentration	6110
Standard deviation of concentration	4900
t-value for UCL calculation	1.746



95% Upper Confidence Limit (UCL)	8180
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	12000
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	1500
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	Yes

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Draft version - Do not distrubute

APPENDIX F

SURVEY REPORT

Windy Creek Surveys, LLC.
2650 Monteverde Rd., Fairbanks, AK. 99709
"Survey support for environmental monitoring"
Phone: (907) 455-6776, Fax: (907) 455-6776
Email: **ejc@windycreeksurveys.com**

October 1, 2019

Mr. Craig Martin
Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Dear Mr. Martin,

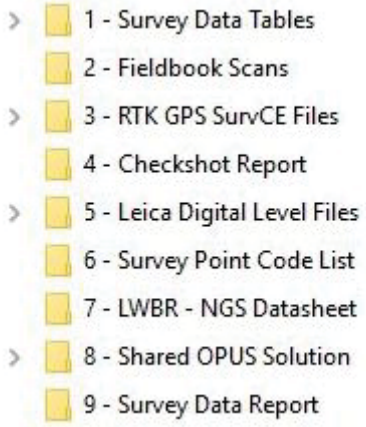
This letter is to serve as our Survey Report for the Fort Wainwright Operable Unit 6 (OU6) monitor well survey. The Horizontal Datum utilized to establish the coordinates for this project is NAD_83(2011) Epoch 2010.0000, and the Vertical Datum is NAVD88 computed using Geiod12B. The Basis of Coordinates for this work is the 2018 OPUS solution for July 19, 2018 data on Point 576 (NGS OPUS Shared Solution "BBGB07").

The environmental point locations RTK field survey was conducted on September 7th, 2019 utilizing 2 JAVAD Triumph-1 GNSS receivers. We collected the monitor well locations with single base station RTK GPS data collected using Carlson SurvCE v5.0 software. We applied the localization "FTW.OPUS.CNTL_h.WGS84.UTM.Z6_v.NAVD88_Meters.loc" that was created utilizing data collected during the 2017 FTW CANOL Pipeline Breaks Sites survey, which was based upon the RTK GNSS survey locations taken on monuments, using the OPUS derived control coordinates along with their leveled NAVD88 orthometric elevation data. For all topographic points positioned for this effort the Horizontal Standard Deviation (HSDV) did not exceed 0.036 meters on the northing/easting determinations, and the Vertical Standard Deviation (VSDV) did not exceed 0.023 meters on the elevation determinations.

Our checkshots compared our RTK GNSS generated localized coordinates to the available OPUS DB Shared Solution coordinates for the Monuments that we surveyed through. The maximum positional error for any one of these checkshots was 0.040 meters in northing/easting and 0.085 meters in elevation. The results are well within the most stringent standards that can be found in the USACE Alaska 2017 District Manual for Electronic Deliverables - Field Data Collection Survey Quality Requirements.

The Basis of Elevations is the FTW Basis of Vertical Control monument "LADD WEST BASE RESET", with its NAVD88 orthometric height (computed using Geoid12B) listing of 136.339 meters (refer to NGS Datasheet PID: TT2777). Transfer of elevation from this monument began on November 2, 2017. The Monitor Well vertical control survey was conducted on September 7th, and 8th of 2019. Elevations were established on the top of PVC of each well. A Leica DNA03 level and a fiberglass Leica rod were utilized to complete the level loops that established these elevations. Leica Geo Office 7.0 software was utilized to process the level loops.

An image of the Survey Data file structure and its pared down naming structure can be seen at the top of the next page.



Windy Creek Surveys, LLC. 2650 Monteverde Rd., Fairbanks, AK. 99709

"Survey support for environmental monitoring" Phone: (907) 455-6776, Fax: (907) 455-6776
Email: **ejc@windycreeksurveys.com**

500 series points (listed below) are USACE Brass Cap monuments on Fort Wainwright. The coordinates shown are the OPUS DB Solutions for each respective monument, converted to WGS84, UTM Zone 6. Top of monument elevations listed to greater precision had 3rd Order Leveling performed based upon LADD WEST BASE RESET.

1000 series points were located with RTK GNSS, and display Monitor Well Locations and Top of PVC elevations. 2000 series points are at the identical location as the Wells but they display the ground elevation at that point.

In the Survey Data Table listing below Columns B & C are CGS WGS84 UTM Zone 6N coordinates in meters. The Column D listings are NAVD88 orthometric elevations (in meters).

=== Control ===

Column A	Column B	Column C	Column D	Column E	Column F
585	7190915.953	470500.563	137.188	BCMON.LFC-66A	DATE:09-13-2016 TIME:12:00:00
576	7189403.595	469466.572	138.428	BCMON.MBL-16	DATE:07-19-2018 TIME:12:00:00
582	7189190.820	468682.907	139.892	ALMON.TG-2	DATE:08-08-2016 TIME:12:00:00
580	7189649.851	469742.945	138.252	BCMON.FWURS-05	DATE:09-13-2016 TIME:12:00:00
589	7191135.588	469445.183	136.573	BCMON.LFC-71	DATE:08-24-2017 TIME:12:00:00

=== Monitor Well Locations ===

Column A	Column B	Column C	Column D	Column E	Column F
1515	7188960.509	468212.714	137.345	OU6-MW03	DATE:09-07-2019 TIME:11:56:27
1504	7189282.937	468299.122	137.382	OU6-MW06A	DATE:09-07-2019 TIME:11:07:39
1520	7189084.327	468671.232	138.259	OU6-MW08	DATE:09-07-2019 TIME:12:22:17
1512	7189207.330	468339.204	136.446	OU6-MW12R	DATE:09-07-2019 TIME:11:40:38
1519	7188850.350	468562.038	137.785	OU6-MW13	DATE:09-07-2019 TIME:12:17:05
1513	7189191.855	468292.748	137.848	OU6-MW28	DATE:09-07-2019 TIME:11:42:21
1514	7189241.913	468251.456	136.869	OU6-MW32R	DATE:09-07-2019 TIME:11:44:03
1511	7189236.256	468332.998	137.354	OU6-MW33	DATE:09-07-2019 TIME:11:36:03
1506	7189378.019	468207.038	136.753	OU6-MW35	DATE:09-07-2019 TIME:11:13:35
1507	7189411.984	468265.208	137.143	OU6-MW37	DATE:09-07-2019 TIME:11:14:55
1509	7189389.494	468453.545	137.006	OU6-MW38	DATE:09-07-2019 TIME:11:28:57
1527	7189278.296	468651.834	137.559	OU6-MW39	DATE:09-07-2019 TIME:12:33:50
1523	7189196.039	468639.841	137.546	OU6-MW47	DATE:09-07-2019 TIME:12:27:47
1521	7189130.025	468629.155	137.600	OU6-MW48	DATE:09-07-2019 TIME:12:23:46
1505	7189310.344	468272.052	136.539	OU6-MW58	DATE:09-07-2019 TIME:11:11:16
1518	7189181.217	468442.402	137.122	OU6-MW61	DATE:09-07-2019 TIME:12:11:10
1516	7189252.445	468400.528	136.862	OU6-MW62	DATE:09-07-2019 TIME:12:07:22
1503	7189276.357	468362.981	137.031	OU6-MW64	DATE:09-07-2019 TIME:11:05:06
1508	7189388.046	468390.877	137.958	OU6-MW77	DATE:09-07-2019 TIME:11:27:39

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Column A	Column B	Column C	Column D	Column E	Column F
1524	7189246.333	468663.214	137.666	OU6-MW78	DATE:09-07-2019 TIME:12:29:06
1522	7189162.879	468661.721	138.213	OU6-MW79	DATE:09-07-2019 TIME:12:25:25
1517	7189172.976	468452.933	136.986	OU6-MW80	DATE:09-07-2019 TIME:12:10:17
1510	7189521.859	468315.755	137.690	OU6-MW82	DATE:09-07-2019 TIME:11:30:55
1525	7189255.491	468680.355	137.700	OU6-MW91	DATE:09-07-2019 TIME:12:30:06
1528	7189266.206	468704.349	137.676	OU6-MW93	DATE:09-07-2019 TIME:12:36:42

=== Bore Hole Locations ===

Column A	Column B	Column C	Column D	Column E	Column F
2515	7188960.509	468212.714	136.81	OU6-MW03.g	DATE:09-07-2019 TIME:11:56:27
2504	7189282.937	468299.122	136.36	OU6-MW06A.g	DATE:09-07-2019 TIME:11:07:39
2520	7189084.327	468671.232	137.55	OU6-MW08.g	DATE:09-07-2019 TIME:12:22:17
2512	7189207.330	468339.204	136.33	OU6-MW12R.g	DATE:09-07-2019 TIME:11:40:38
2519	7188850.350	468562.038	136.87	OU6-MW13.g	DATE:09-07-2019 TIME:12:17:05
2513	7189191.855	468292.748	136.92	OU6-MW28.g	DATE:09-07-2019 TIME:11:42:21
2514	7189241.913	468251.456	136.77	OU6-MW32R.g	DATE:09-07-2019 TIME:11:44:03
2511	7189236.256	468332.998	136.35	OU6-MW33.g	DATE:09-07-2019 TIME:11:36:03
2506	7189378.019	468207.038	135.68	OU6-MW35.g	DATE:09-07-2019 TIME:11:13:35
2507	7189411.984	468265.208	136.14	OU6-MW37.g	DATE:09-07-2019 TIME:11:14:55
2509	7189389.494	468453.545	136.04	OU6-MW38.g	DATE:09-07-2019 TIME:11:28:57
2527	7189278.296	468651.834	136.79	OU6-MW39.g	DATE:09-07-2019 TIME:12:33:50
2523	7189196.039	468639.841	136.71	OU6-MW47.g	DATE:09-07-2019 TIME:12:27:47
2521	7189130.025	468629.155	137.28	OU6-MW48.g	DATE:09-07-2019 TIME:12:23:46
2505	7189310.344	468272.052	136.44	OU6-MW58.g	DATE:09-07-2019 TIME:11:11:16
2518	7189181.217	468442.402	136.85	OU6-MW61.g	DATE:09-07-2019 TIME:12:11:10
2516	7189252.445	468400.528	136.54	OU6-MW62.g	DATE:09-07-2019 TIME:12:07:22
2503	7189276.357	468362.981	136.11	OU6-MW64.g	DATE:09-07-2019 TIME:11:05:06
2508	7189388.046	468390.877	136.62	OU6-MW77.g	DATE:09-07-2019 TIME:11:27:39
2524	7189246.333	468663.214	136.75	OU6-MW78.g	DATE:09-07-2019 TIME:12:29:06
2522	7189162.879	468661.721	137.28	OU6-MW79.g	DATE:09-07-2019 TIME:12:25:25
2517	7189172.976	468452.933	136.41	OU6-MW80.g	DATE:09-07-2019 TIME:12:10:17
2510	7189521.859	468315.755	136.67	OU6-MW82.g	DATE:09-07-2019 TIME:11:30:55
2525	7189255.491	468680.355	136.95	OU6-MW91.g	DATE:09-07-2019 TIME:12:30:06
2528	7189266.206	468704.349	136.88	OU6-MW93.g	DATE:09-07-2019 TIME:12:36:42

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=== Checkshots ===

Column A	Column B	Column C	Column D	Column E	Column F
1501	7190915.940	470500.564	137.205	CHK.585	DATE:09-07-2019 TIME:10:38:30
1502	7189403.555	469466.572	138.513	CHK.576	DATE:09-07-2019 TIME:10:51:33
1529	7189190.808	468682.899	139.952	CHK.582	DATE:09-07-2019 TIME:12:42:42
1533	7189649.840	469742.946	138.309	CHK/580	DATE:09-07-2019 TIME:15:36:19
1537	7191135.601	469445.184	136.611	CHK.589	DATE:09-07-2019 TIME:17:03:26

Survey Data deliverables include a Data Sheet listing the monitor wells, and soil boring positions in CGS WGS84 UTM Zone 6N meters, with the elevations in NAVD88 meters, as per the Datum/Coordinate System requirements for an Army Environmental Project set forth in the U.S. Army Corps of Engineers - Alaska District 2017 Manual for Electronic Deliverables. A comma delimited file including all of the monitor wells and bore hole positions, pdf copy of the fieldbook, digital level files, Carlson SurvCE RTK GPS data files utilized for positioning MWs, modified checkshot report, survey point code list, and a OPUS DB Shared Solution.

Sincerely,

X

Eric J. Cousino, PLS

REVIEW COMMENTS AND RESPONSES

-----Original Message-----
From: Marshall, Sara N (DEC) [mailto:sara.marshall@alaska.gov]
Sent: Friday, April 24, 2020 2:50 PM
To: Adams, Brian M CIV USARMY IMCOM PACIFIC (USA) <brian.m.adams18.civ@mail.mil>
Cc: halstead.sandra@epa.gov; Blake, Erica L (DEC) <erica.blake@alaska.gov>; seth.a.reedy.civ@mail.mil; brianne.r.clark.civ@mail.mil; matthew.h.sprau.civ@mail.mil; Beausang, Andrea L CIV USARMY CEPOA (USA) <Andrea.L.Beausang@usace.army.mil>; Hazlett, Robert C CIV USARMY CEPOA (USA) <Bob.C.Hazlett@usace.army.mil>; David.b.mays.civ@mail.mil; amanda.r.sherman3.civ@mail.mil
Subject: [Non-DoD Source] RE: Draft 2019 Groundwater Monitoring Report Operable Unit 6 (OU6) Fort Wainwright, Alaska

Dear Mr. Adams,

The Alaska Department of Environmental Conservation (DEC) has completed a review of the above referenced document provided by Fort Wainwright Alaska on March 26, 2020. This report documents the groundwater monitoring activities Operable Unit 6 the Former Communication site on Fort Wainwright. DEC has no comments at this time. Please provide a final document for approval.

If you have any questions, please contact the DEC Project Manager at (907) 451-2156, or by email at sara.marshall@alaska.edu.

Sincerely,

Sara Marshall
Environmental Program Specialist
Contaminated Sites Program
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709
Telephone: (907) 451-2156
Email: sara.marshall@alaska.gov

-----Original Message-----
From: Halstead, Sandra [mailto:Halstead.Sandra@epa.gov]
Sent: Thursday, April 23, 2020 5:37 PM
To: Adams, Brian M CIV USARMY IMCOM PACIFIC (USA) <brian.m.adams18.civ@mail.mil>; Reedy, Seth A CIV USARMY IMCOM PACIFIC (USA) <seth.a.reedy.civ@mail.mil>; Clark, Brianne R CIV USARMY IMCOM PACIFIC (USA) <brianne.r.clark.civ@mail.mil>
Cc: Blake, Erica L (DEC) <erica.blake@alaska.gov>; Marshall, Sara N (DEC) <sara.marshall@alaska.gov>; Hazlett, Robert C CIV USARMY CEPOA (USA) <robert.c.hazlett4.civ@mail.mil>
Subject: [Non-DoD Source] EPA comments on Draft Fort Wainwright 2019 OU 6 report

EPA has no substantial comments for the Draft Fort Wainwright 2019 OU 6 report.

Confirmation of groundwater flow to the northwest is clear for all but the area around the sentry wells, where the flow direction appears more due north to northeast.

The 'downgradient' well of the TCP plume, MW-47, exceeds 123-TCP cleanup levels. Are there any wells further downgradient that can help define plume boundaries?

The monitoring wells MW80 and MW61 designated to monitor the TCE plume have statistically reached attainment, however reductive dechlorination and detection of daughter products cis-1,2-DCE and Vinyl Chloride suggest the wells should continue to be monitored annually.

No official response to these comments is necessary.

The report may be finalized pending comments and approval from ADEC.

Sandra Halstead
Superfund Site Manager
EPA R10 Alaska Operations Office
222 W. 7th Ave, Box 19
Anchorage, AK 99513

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