Final
2020 Monitoring Report
Former Communications Site, Operable Unit 6

U.S. Army Garrison Alaska

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Contract W911KB-17-D-0020
Task Order W911KB-20-F-0053

MAY 2021

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

May 28, 2021

Directorate of Public Works

Subject: Submission of the Final 2020 Former Communications Site, Operable Unit 6 Monitoring Report, to the Environmental Protection Agency

Ms. Sandra Halstead
Environmental Protection Agency
Remedial Project Manager
Alaska Operations Office
222 W. 7th Ave, #19
Anchorage, AK 99513

Dear Ms. Halstead:

This letter documents transmission of the Final 2020 Former Communications Site, Operable Unit 6 Monitoring Report, Fort Wainwright to the Environmental Protection Agency (EPA).

A digital copy of the document will be provided to you. A copy of this document is being provided to Ms. Erica Blake, Remedial Project Manager (RPM), Alaska Department of Environmental Conservation; and Mr. Christopher Zell, Alternate RPM, EPA. 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 Mr. Brian Adams, RPM at (907) 361-6623 or email brian.m.adams18.civ@mail.mil, or Mr. Seth Reedy, Alternate RPM at (907) 361-6489 or email seth.a.reedy.civ@mail.mil.

Sincerely,

Brian M. Adams
Remedial Program Manager,
Directorate of Public Works

cc:
HQ, USAG FWA CERCLA Information Repository (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

May 28, 2021

Directorate of Public Works

Subject: Submission of the Final 2020 Former Communications Site, Operable Unit 6 Monitoring Report, to the State of Alaska Department Environmental Conservation.

Ms. Erica Blake
Remedial Project Manager
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709

Dear Ms. Blake:

This letter documents transmission of the Final 2020 Former Communications Site, Operable Unit 6 Monitoring Report, Fort Wainwright to the State of Alaska Department Environmental Conservation (ADEC).

A digital copy of the document and the associated laboratory deliverables will be provided to you. A copy of the document is also being provided to Ms. Sandra Halstead, Remedial Project Manager (RPM) and Mr. Christopher Zell, Alternate RPM, 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 Mr. Brian Adams, RPM at (907) 361-6623 or email brian.m.adams18.civ@mail.mil, or Mr. Seth Reedy, Alternate RPM at (907) 361-6489 or email seth.a.reedy.civ@mail.mil.

Sincerely,

Brian M. Adams
Remedial Program Manager,
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Final

2020 Monitoring Report

Former Communications Site, Operable Unit 6

Contract W911KB-17-D-0020
Task Order W911KB-20-F-0053

MAY 2021

Prepared For:
U.S. Army Garrison Alaska

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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS ..... **V**
EXECUTIVE SUMMARY **ES-1**
DRO Groundwater Plume Summary ES-1
TCP Groundwater Plume Summary ES-2
TCE Groundwater Plume Summary ES-2
Institutional Control Inspection Summary ES-2
1.0 INTRODUCTION **1-1**
1.1 Project Overview and Monitoring Report Organization 1-1
1.2 OU6 Source Area Tracking 1-2
1.3 Project Location and Background 1-2
1.3.1 Site History 1-2
1.3.2 Investigation Summary 1-2
1.3.3 Remedial Summary 1-3
1.3.4 Long-Term Monitoring 1-3
1.4 Regulatory Considerations 1-4
1.4.1 Remedial Action Objectives 1-4
1.4.2 Project Cleanup Levels 1-4
2.0 FIELD ACTIVITIES SUMMARY **2-1**
2.1 Groundwater Sampling and Analysis 2-1
2.2 Decontamination 2-2
2.3 Investigation-Derived Waste Handling and Disposal 2-2
2.4 Institutional Control Inspections 2-3
3.0 GROUNDWATER SAMPLE RESULTS **3-1**
3.1 Groundwater Elevations 3-1
3.2 DRO Plume Sample Results 3-1
3.2.1 DRO and RRO in the Main DRO Plume 3-2
3.2.2 DRO and RRO in the Two Isolated DRO Plumes 3-3
3.2.3 DRO and RRO in Downgradient Wells 3-4
3.3 TCP Plume Sample Results 3-4
3.4 TCE Plume Sample Results 3-5
3.5 Natural Attenuation Evaluation 3-5
3.5.1 Geochemical Conditions within the DRO Plumes 3-6
3.5.2 Geochemical Conditions in the TCP Plume 3-7
3.5.3 Geochemical Conditions in the TCE Plume 3-7
3.6 Groundwater Sample Data Quality 3-7
4.0 CONTAMINANT TREND AND PLUME ANALYSIS **4-1**
4.1 Statistical Evaluation of Contaminant Concentration Trends 4-1
4.2 DRO and RRO Trend and Plume Analysis 4-1
4.2.1 DRO and RRO Trend Analysis 4-1
4.2.2 DRO Trend Analysis Using EPA Groundwater Statistics Tool 4-3
4.2.3 DRO and RRO Plume Analysis 4-4
4.2.4 DRO Plume Redundancy and Sample Frequency Analysis 4-4

TABLE OF CONTENTS (CONTINUED)

4.3 TCP Trend Analysis 4-5
4.3.1 TCP Mann-Kendall Trend Analysis 4-5
4.3.2 TCP Trend Analysis Using EPA Groundwater Statistics Tool 4-5
4.4 TCE Trend Analysis 4-7
4.4.1 TCE Mann-Kendall Trend Analysis 4-7
4.4.2 TCE Trend Analysis Using EPA Groundwater Statistics Tool 4-7

5.0 CONCLUSIONS AND RECOMMENDATIONS 5-1

5.1 DRO Plume Summary 5-1
5.2 TCP Plume Summary 5-1
5.3 TCE Plume Summary 5-1
5.4 Recommendations 5-2

6.0 REFERENCES 6-1

TABLES

Table 1-1 Summary of OU6 Source Area Tracking Numbers
Table 1-2 OU6 Project Cleanup Levels for Groundwater
Table 2-1 OU6 Groundwater Sampling Summary
Table 4-1 Mann-Kendall Trend Results for the DRO Plumes
Table 4-2 Statistical Evaluation of DRO in MW12R
Table 4-3 Plume Stability Results for the Main DRO Plume Network
Table 4-4 Mann-Kendall Trend Results for the TCP Plume, MW47 and MW79
Table 4-5 Statistical Evaluation of TCP in MW47 and MW08
Table 4-6 Mann-Kendall Trend Results for the TCE Plume, MW61
Table 4-7 Cleanup Complete Evaluation for TCE in MW61
Table 5-1 Monitoring Wells Recommended for Decommissioning in 2021

GRAPHS

Graph 3-1 DRO Concentrations in the Main DRO Plume
Graph 3-2 RRO Concentrations in the Main DRO Plume
Graph 3-3 DRO Concentrations in MW62 and MW77
Graph 3-4 RRO Concentrations in MW62 and MW77
Graph 3-5 TCP Concentrations in MW47 and MW79
Graph 4-1 Geometric Regression of DRO Concentrations in MW12R
Graph 4-2 Geometric Regression of TCP Concentrations in MW47
Graph 4-3 Geometric Regression of TCE Concentrations in MW61

TABLE OF CONTENTS (CONTINUED)

FIGURES

Figure 1-1 Site Location and Vicinity
Figure 2-1 Groundwater Monitoring Wells Sampled in 2020
Figure 3-1 Groundwater Elevation Contours
Figure 3-2 DRO Plume Groundwater Sample Results
Figure 3-3 TCP Plume Groundwater Sample Results
Figure 3-4 TCE Plume Groundwater Sample Results

APPENDICES

Appendix A Sample Summary and Analytical Results
Appendix B CDQR and ADEC Laboratory Data Review Checklists
Appendix C Field Forms and Notes
Appendix D Photograph Log
Appendix E LTMO Results

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFCEE	Air Force Center for Environmental Excellence
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
bgs	below ground surface
Brice	Brice Engineering, LLC
btoc	below top of casing
CDQR	Chemical Data Quality Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Cost-Effective Sampling
COC	contaminant of concern
cy	cubic yards
DCE	dichloroethene
DERA	Defense Environmental Restoration Account
DO	dissolved oxygen
DoD	U.S. Department of Defense
DPW	Directorate of Public Works
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
FES	Fairbanks Environmental Services Inc.
FCS	Former Communication Site
FFA	Federal Facilities Agreement
ft	feet
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
LL	low level
LTMO	Long Term Monitoring Optimization
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
NA	not analyzed

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum of 1988
ND	not detected
NE	not established
NM	not measured
Oasis	Oasis Environmental Inc.
ORP	oxidation-reduction potential
OU6	Operable Unit 6
PCB	polychlorinated biphenyls
PSE	Preliminary Source Evaluation
PCL	project cleanup level
POL	petroleum, oil, and lubricants
QC	quality control
QSM	Quality Systems Manual
RAO	Remedial Action Objective
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RRO	residual range organics
SVOC	semi-volatile organic compounds
TCE	trichloroethene
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
USAG	U.S. Army Garrison
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 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 five areas of groundwater contamination: three adjacent diesel range organics (DRO) groundwater plumes, one 1,2,3-trichloropropane (TCP) plume, and one trichloroethene (TCE) plume. In addition, groundwater samples are collected from background wells and sentry wells located near a water supply well.

Groundwater samples were collected from 18 wells during August 2020. Samples were submitted for analyses that varied depending upon the plume that was being monitored. Sample results were compared to ROD PCLs. Groundwater monitoring results between 2007 and 2020 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 ten wells associated with the DRO plumes. Four wells were sampled within the main DRO plume, two wells within two isolated and adjacent DRO plumes, three wells located downgradient and crossgradient of the DRO plumes, and one background well located upgradient.

DRO exceeded the PCL in two wells associated with the main plume and one well in an adjacent isolated plume. RRO was below the PCL in all wells except for one well in the main DRO plume; although, another well within an isolated plume had a non-detect RRO result with a limit of detection (LOD) that exceeded the PCL. Overall, DRO and RRO concentrations were lower in 2020 than in 2019, which was likely attributed to the lower groundwater elevations observed in 2019. In areas where residual non-aqueous phase liquid (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. Monitoring well MW33, located within the main DRO plume, continues to be the well with the highest DRO and RRO concentrations.

DRO and RRO concentrations in the interior of the main 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, and lower concentrations of sulfate, are evidence that metal and sulfate reduction are significant biodegradation processes in the main DRO plume source area. An estimation of the time to cleanup could only be determined for (slightly upgradient) well MW12R (expected 2022) as it was the only well associated with the main DRO plume that had a decreasing trend. When NAPL within the main DRO plume is depleted and no longer generates dissolved contaminant concentrations, decreasing trends in other wells should become apparent.

The two isolated plumes appear to represent smaller, lower concentration source areas. DRO concentrations associated with one plume (identified by MW62) have only exceeded the PCL once since 2012, which indicates the residual NAPL in the surrounding soil may be depleted. DRO concentrations

associated with the other isolated plume (identified by MW77) have been highly variable and have exceeded the PCL in recent 2018, 2019, and 2020 sampling events.

TCP Groundwater Plume Summary

Groundwater samples were submitted for analysis of low level volatile organic compounds (VOCs) and geochemical parameters from three wells associated with the TCP plume, two downgradient sentry wells, and one upgradient background well. TCP source area well MW79 and downgradient well MW47 consistently have TCP concentrations exceeding the PCL, and slightly upgradient well MW08 last had TCP concentrations exceeding the PCL in 2012. 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.

Groundwater samples were collected from two sentry wells (MW78 and MW91) and one background well (MW13) located downgradient and upgradient of the TCP plume, respectively. TCP has never been detected in any of the sentry wells, and has only been detected once in the background well (in 2008).

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 at least 2011. Although there was a slight increase in the TCE concentration at MW61 in 2020, which is most likely due to elevated groundwater elevations, 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 U.S. Environmental Protection Agency (EPA) requirements (EPA 2014b).

Vinyl chloride, a reductive dechlorination daughter product of TCE, was detected above the Alaska Department of Environmental Conservation (ADEC) cleanup level in MW61 in 2019 but was not detected in 2020. Although TCE daughter products were not identified as ROD COCs, continued formation of daughter products can be reasonably expected in an anaerobic aquifer. Therefore, using a method and/or laboratory that has LODs below the current ADEC cleanup levels for daughter products (including vinyl chloride) should be continued in future sampling events.

Institutional Control Inspection Summary

The annual IC inspection of OU6 was conducted during September 2020. 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) exceeding 6 inches in the backyards of two residences. The Army contacted the housing operator who issued notices to the two residents, and the deficiencies were corrected.

1.0 INTRODUCTION

This report documents groundwater sampling activities at the Operable Unit 6 (OU6) Former Communications Site (FCS) on Fort Wainwright, Alaska, during August 2020. This document also provides a summary of the institutional control (IC) inspections conducted at the OU6 site in 2020. Brice Engineering, LLC (Brice) is providing this service under contract to the U.S. Army Corps of Engineers (USACE); Contract Number W911KB-17-D-0020, Task Order W911KB-20-F-0053. The work was completed according to the Postwide Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP; Brice 2020a); *2020 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan* (Brice 2020b); under authority of CERCLA; and in compliance with the OU6 Record of Decision (ROD; U.S. Army Garrison [USAG] 2014), Federal Facilities Agreement (FFA), and State of Alaska regulations.

The primary objectives for the 2020 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 (USAG 2014), previously detected contaminants (USACE 2012b), and geochemical parameters.
- Compare results with ROD-established project cleanup levels (PCLs) (USAG 2014).
- 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 IC inspections conducted at OU6 during 2020.

1.1 Project Overview and Monitoring Report Organization

The 2020 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, such as laboratory reports, is not provided in the hard copy but is provided in the Supplemental Information folder on the CD accompanying this report.

- Appendix A – Sample Summary and Analytical Results
- Appendix B – Chemical Data Quality Report (CDQR) and Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklists
- Appendix C – Field Forms and Notes
- Appendix D – Photograph Log

- Appendix E – Long-Term Monitoring Optimization (LTMO) Results

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[1]	ADEC FILE NUMBER[2]	ADEC SPILL NUMBERS	ADEC HAZARD ID	ARMY HQAES NUMBER[2]
OU6 Former Communications Site (Taku Gardens)	108.38.085	05309914702 05309914703 06309911001 06309931201	4140	02871.1088

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
1 The Former Communications Site source area is designated as OU7 in the EPA Superfund Enterprise Management System.
2 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 Housing Development. 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 Bassett 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, buried debris of munitions-related items and contamination of soil and groundwater was discovered (Oasis Environmental Inc. [Oasis] 2007). Review of historical documents and characterization of remedial activities conducted between 2005 and 2013 identified five source areas. Contamination found in these areas included polychlorinated biphenyls (PCBs), petroleum compounds, chlorinated compounds, volatile organic compounds (VOCs), semi-volatile 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, 96 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 (USACE 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.
  - In 2008, five additional monitoring wells were installed to delineate the boundaries of the contaminated groundwater plumes.
  - In 2009, nine additional monitoring wells were installed as part of the TCP investigation to delineate TCE and diesel range organics (DRO) plume boundaries.
- Post-RI activities were conducted between 2010 and 2017 (USACE 2012a; USACE 2013; USACE 2014; and USACE 2018)
  - 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.
  - 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.
  - In 2013, two unusable wells were decommissioned, and two permanent monitoring wells were installed to serve as replacement monitoring wells.
  - In 2016, 57 monitoring wells were decommissioned or abandoned in place with the approval and guidance of ADEC.
  - In 2017, six additional monitoring wells and one temporary well were decommissioned.

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 2014). In addition, 2,934 items of munitions-related debris and 1,061 drums were disposed of. Some residual debris could not be removed from the site because of concerns about the structural stability of nearby buildings. Buildings where debris appeared to continue beneath the foundation and could not be removed are shown on Figure 2-1. 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 96 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 TCP plume; one main DRO plume; and two smaller DRO plumes associated with wells MW62 and MW77.

Since 2010, several wells have been removed from the sampling program and have been decommissioned (USACE 2018). In 2019, the sampling frequency was decreased from semi-annual to annual, and an additional seven wells were removed from the sampling program. Presently, 28 wells exist at the site, 18 of which were included in the 2020 annual monitoring program to assess remaining contaminant levels and trends.

1.4 Regulatory Considerations

Remedial Action Objectives (RAOs) and PCLs for groundwater were identified in the OU6 ROD (USAG 2014) 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 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 residual range organics (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[1] (µg/L)
1,2,3-TCP	0.12
TCE	5
DRO	1,500
RRO	1,100

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[1] PCLs are established in 18 AAC 75.345, Table C (ADEC 2020).

2.0 FIELD ACTIVITIES SUMMARY

This section describes the groundwater sampling activities, investigation-derived waste (IDW) handling activities, and a summary of the annual IC inspections at the OU6 site.

2.1 Groundwater Sampling and Analysis

Groundwater samples were collected from 18 monitoring wells on 11-13 August 2020. Groundwater monitoring was conducted in accordance with the procedures detailed in the 2020 CERCLA Sites Work Plan (Brice 2020b) and Postwide UFP-QAPP (Brice 2020a). The general contaminant plume areas and associated monitoring wells sampled during the 2020 monitoring event are depicted on Figure 2-1.

Prior to sampling, the condition of each well was inspected. All wells were found to be in satisfactory condition for continued use in monitoring the site. The static water level was measured to the nearest 0.01 foot, relative to the top of the monitoring well casing. Water levels and total depths were measured using an electronic water level probe. The water level was within the well screen interval for all wells sampled, with four exceptions: MW78, MW91, MW80, and MW12R. Sentry wells MW78 and MW91 were intentionally 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), which is also screened deep; and MW80, located within the TCE plume, was also intentionally screened below the water table to evaluate the vertical extent of contamination. MW12R, located within the main DRO plume, was not intentionally screened below the water table but the water table was slightly above the screen during sampling due to elevated water levels in 2020. Impact to the project is negligible as free project has not been previously measured in this well. Water level measurements were recorded on groundwater sampling forms (provided in Appendix C) and groundwater elevations were calculated, as further discussed in Section 3.1.

Samples were collected with submersible pumps using dedicated tubing for each monitoring well. The pump intake was placed approximately 1 foot below the water table when the water level was within the screened interval, or in the middle of the screened interval when the water level was above the screen. Groundwater was purged at a rate between 0.03 and 0.15 gallons per minute. Water quality measurements were recorded every 5 minutes and monitoring wells were purged until water quality parameters stabilized, per ADEC guidance (ADEC 2019b). Field parameters were measured using YSI water quality meters installed in a flow through cell and a turbidity meter. The instruments were calibrated at the beginning of each day according to the manufacturer's instructions. Parameters measured included pH, temperature, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity, which were recorded on groundwater sample forms.

Groundwater samples were shipped to Agriculture & Priority Pollutants Laboratories, Inc. (APPL) of Clovis, California, for analysis on 15 August 2020. Groundwater samples were submitted for the analyses as indicated in Table 2-1 on the following page.

Table 2-1 OU6 Groundwater Sampling Summary

CONTAMINANT AREA	NUMBER OF WELLS	MONITORING WELLS	ANALYTICAL PARAMETERS
Background	2	MW03	DRO, RRO, Dissolved Iron and Manganese, Sulfate
		MW13	VOC-LL, Dissolved Iron and Manganese, Sulfate
DRO Plumes	9	MW06A, MW12R, MW33, MW37, MW58, MW62, MW64, MW77, MW82	DRO, RRO, Dissolved Iron and Manganese, Sulfate
1,2,3-TCP Plume	3	MW08, MW47, MW79	VOC-LL, Dissolved Iron and Manganese, Sulfate
TCE Plume	2	MW61, MW80	VOC, VOC-LL, Dissolved Iron and Manganese, Sulfate
Sentry Wells	2	MW78, MW91	VOC-LL

Notes:
For definitions, refer to the Acronyms and Abbreviations section.

The sample summary and analytical results tables are presented in Appendix A. An evaluation of data quality is detailed in the CDQR and provided in Appendix B. Groundwater sampling and calibration forms, and a summary of the field parameters (Table C-1) are presented in Appendix C. A photo log of groundwater sampling activities is provided in Appendix D. The laboratory deliverables and additional photographs not included in the report are provided electronically on CD in Supplemental Information. Groundwater sample results are discussed in Section 3.

2.2 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. 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, as specified in the 2020 CERCLA Sites Work Plan (Brice 2020b).

2.3 Investigation-Derived Waste Handling and Disposal

IDW generated during OU6 field activities in 2020 included purge water and general refuse (nitrile gloves, paper towels, etc.) from groundwater monitoring activities. All IDW and other waste streams were managed according to the procedures outlined in the 2020 CERCLA Sites Work Plan (Brice 2020b).

Purge water was containerized at the time of sampling in 15-gallon poly drums. The drums were labeled with a unique ID and a form was completed documenting the well ID, container ID, and purge volume from each well. The drums were taken to the Fort Wainwright Defense Environmental Restoration Account (DERA) building for temporary storage. The water was characterized using the laboratory results from the individual wells. Sample results and the IDW storage forms will be provided to an off-Post contractor (e.g., U.S. Ecology) for proper manifesting and disposal in accordance with the CERCLA Off-Site Rule. The non-hazardous solid wastes, including disposable tubing, nitrile gloves, paper towels, etc., were disposed of at the Fairbanks North Star Landfill. Complete documentation of IDW disposal, including purge

water from OU6, will be included in a forthcoming 2020 IDW Management Technical Memorandum (anticipated spring 2021).

2.4 Institutional Control Inspections

IC inspections were conducted at OU6 during September 2020. A summary of the IC objectives and 2020 inspection findings are presented below. Complete inspection results are presented in the 2020 Fort Wainwright IC Inspection Report (Brice 2020c).

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 2020 IC inspections were conducted at the OU6 FCS in accordance with the Institutional Controls Implementation Action Plan (ICIAP), which was included in the 2015 Remedial Design/Remedial Action (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 an on-site inspection, 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 2020, 11 residential units (22 individual yards) were inspected in accordance with the 2020 CERCLA Sites Work Plan (Brice 2020b). In addition, the four residences where IC deficiencies were noted during the 2019 IC inspection were included in the 2020 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 2020 IC inspection findings is presented below, and the complete inspection results are presented in the 2020 Fort Wainwright IC Inspection Report (Brice 2020c).

- Intentional excavation and soil disturbance by homeowners was not observed; however, observations of soil disturbance caused by dogs were noted in four residence backyards. Two of the four yards had soil disturbances that appeared greater than 6 inches bgs. These two yards also had similar soil disturbances in 2019. Directorate of Public Works (DPW) personnel were notified on 01 October 2020 and issued notices to the two residents where soil disturbances were observed.
- 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.

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3.0 GROUNDWATER SAMPLE RESULTS

This section presents the 2020 groundwater monitoring results for OU6. Groundwater monitoring was completed in accordance with the 2020 CERCLA Sites Work Plan (Brice 2020b) and Postwide UFP-QAPP (Brice 2020a). 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. The general locations of the contaminant plumes are depicted on Figure 2-1. Monitoring wells with current and/or historical DRO/RRO, TCP, and TCE results exceeding PCLs are shown on Figures 3-2, 3-3, and 3-4, respectively. Complete 2020 analytical results are presented in Appendix A.

3.1 Groundwater Elevations

Groundwater levels were measured in each well during the sampling event on 11 and 12 August 2020, and groundwater elevations were calculated. The groundwater levels and elevations associated with the sampling events conducted in 2018, 2019, and 2020 are shown in Table 3-1 (located at the end of Section 3.0) for comparison. Groundwater elevations measured in August 2020 were approximately 2.5 feet higher than the May 2019 elevations, and similar in elevation to those measured in September 2018.

Groundwater levels for the purposes of mapping groundwater elevation contours were measured again on 8 September 2020. Due to the flat hydraulic gradient on Fort Wainwright, slight variabilities in water levels over the course of a sampling event (commonly 2 to 3 days at this site) often has an impact on the contours. Therefore, a separate groundwater level measurement event for contours was conducted over the course of a few hours by one person, using the same water level indicator. The contours constructed from these measurements are depicted on Figure 3-1 and indicate that the groundwater flow direction is towards the northwest, consistent with the regional groundwater flow direction. Although the groundwater elevations were on average 0.4 feet lower than those measured during the sampling event, the groundwater flow direction remains consistent with the regional flow direction.

3.2 DRO Plume Sample Results

Ten monitoring wells are currently monitored for DRO and RRO: four wells (MW06A, MW12R, MW33, and MW58) located within the main DRO plume; two wells (MW62 and MW77) located within two smaller isolated DRO plumes; three wells (MW37, MW64, and MW82) located downgradient of the main and isolated DRO plumes; and one well (MW03) located upgradient that serves as a background well. Although not analyzed for DRO and RRO, MNA results for background well MW13 is also included in Table 3-2 (located at the end of Section 3.0) for comparison. DRO and RRO results that have exceeded PCLs between 2007 and 2020 are presented on Figure 3-2; and DRO, RRO, and MNA parameters for 2018 through 2020 sampling events are presented in Table 3-2 (located at the end of Section 3.0).

In general, DRO concentrations in 2020 were lower than the concentrations observed in 2019. This may have been a result of the higher groundwater elevations (approximately 2.5 feet) at the time of the 2020 sampling event. Typically, in areas where residual non-aqueous phase liquid (NAPL) exists, highest contaminant concentrations are measured when groundwater elevations are lowest as NAPL is allowed to drain from soil onto the groundwater surface.

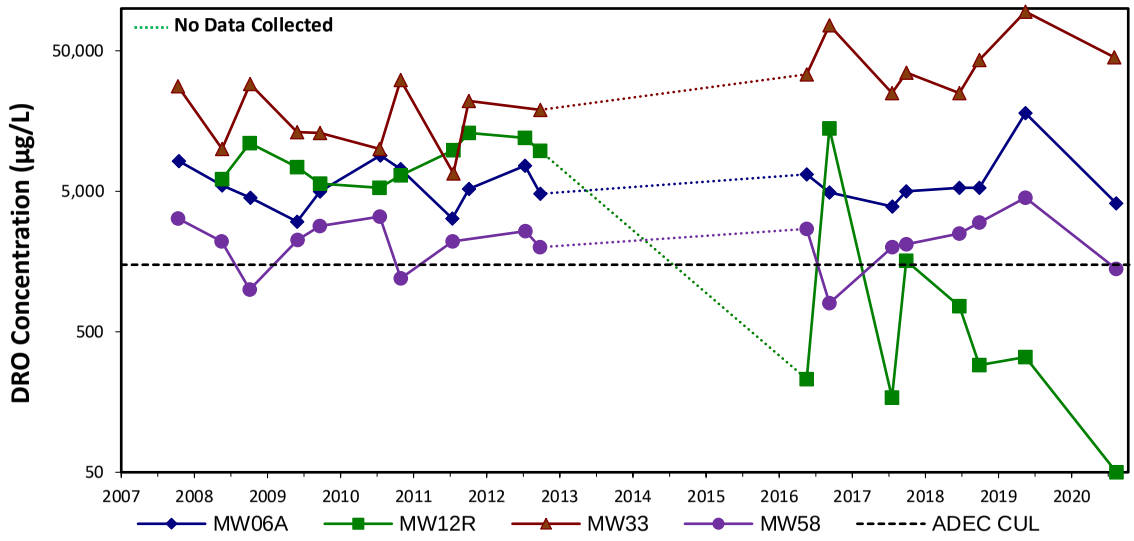
3.2.1 DRO and RRO in the Main DRO Plume

DRO concentrations exceeded the PCL in main DRO plume wells MW06A and MW33, and DRO was detected marginally below the PCL in well MW58, in 2020. DRO has consistently exceeded the PCL (1,500 micrograms per liter [µg/L]) in both MW06A and MW33 since sampling began in 2007, with the highest concentrations observed in MW33 ranging between 6,700 and 95,000 µg/L. DRO periodically exceeds the PCL in MW12R, with the last exceedance shown in 2017 at a concentration of 1,600 µg/L.

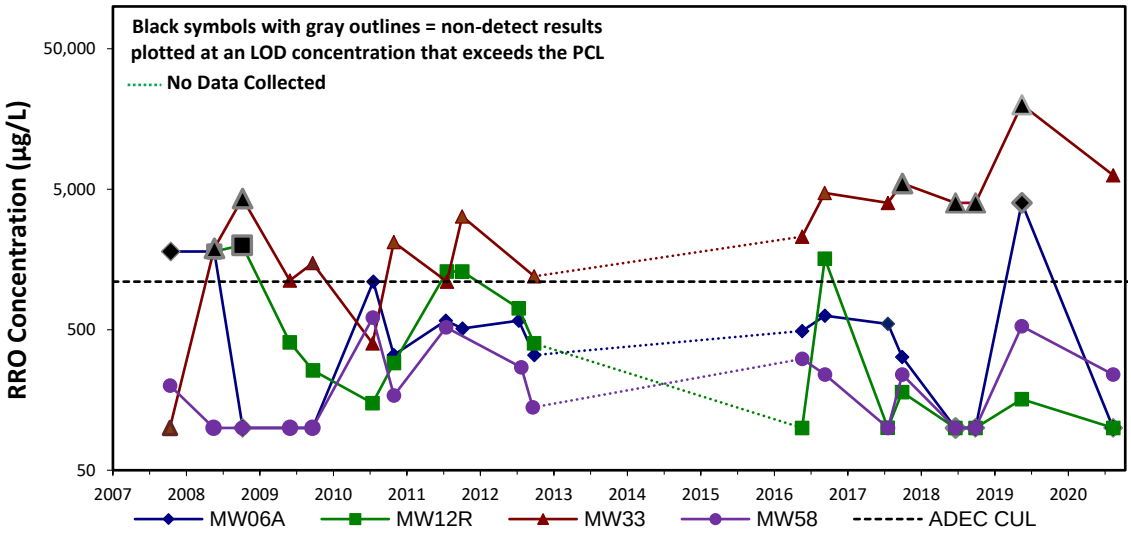
RRO exceeded the PCL (1,100 µg/L) in one well, MW33, at a concentration of 6,300 J µg/L in 2020. RRO detections have been shown to sporadically exceed the PCL in the four main DRO plume wells, with the majority of the exceedances observed in MW33.

Graphs 3-1 and 3-2 show time-series plots of DRO and RRO concentrations, respectively, for the four main DRO plume wells. Note that RRO has periodically not been detected in the main DRO plume wells; however, several limits of detection (LODs) were elevated above the PCL. The elevated LODs are predominately observed in MW33 due to matrix interference and/or sample dilutions caused by high levels of petroleum contamination. These data points are depicted by black symbols with gray outlines on Graph 3-2.

Graph 3-1 DRO Concentrations in the Main DRO Plume



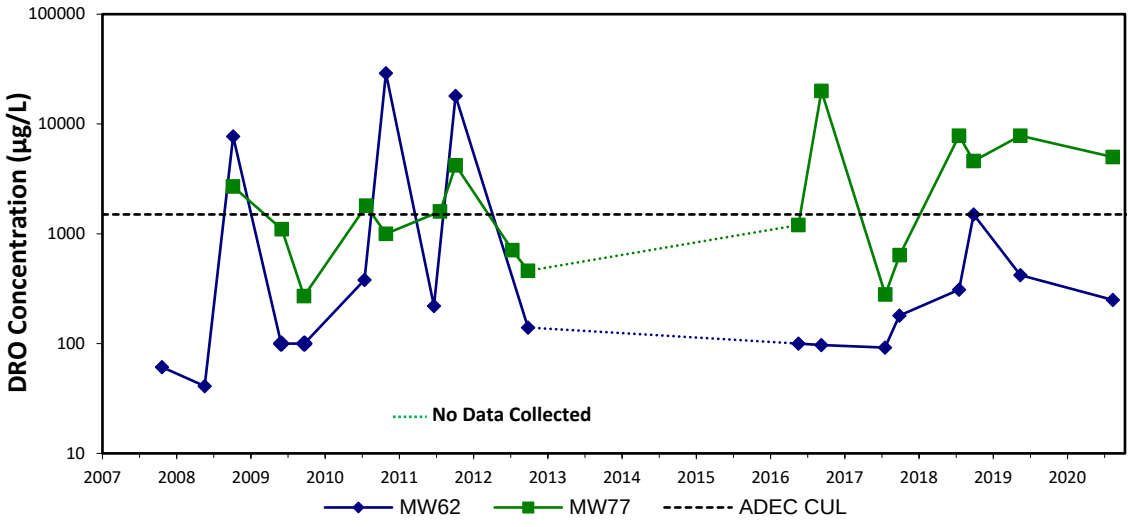
Graph 3-2 RRO Concentrations in the Main DRO Plume



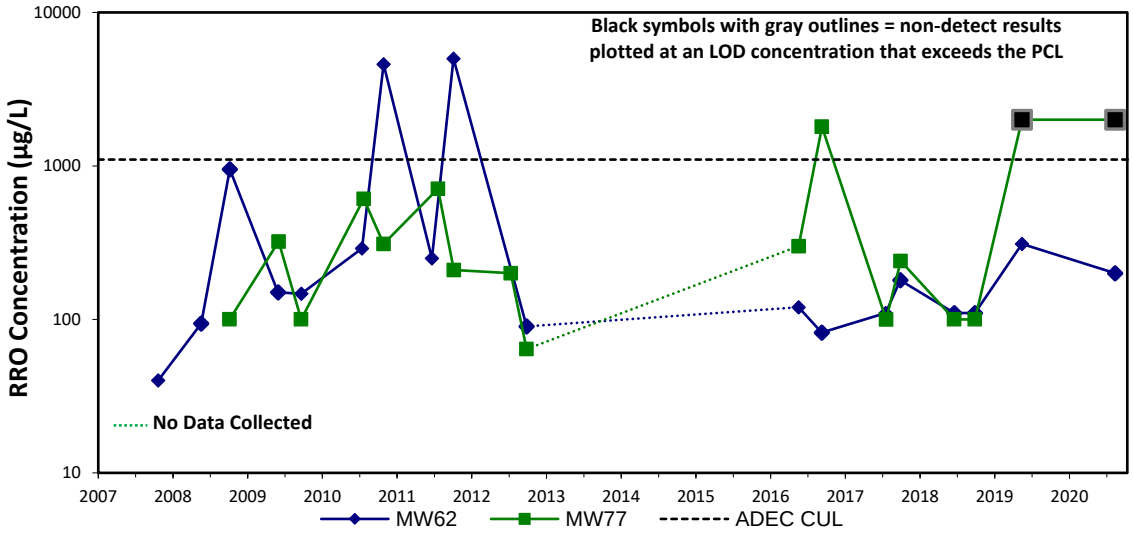
3.2.2 DRO and RRO in the Two Isolated DRO Plumes

Monitoring wells MW62 and MW77 are located within isolated DRO plumes positioned approximately 150 and 400 feet, respectively, north-northeast of the main DRO plume. The DRO concentration exceeded the PCL in MW77 in 2020 and has exceeded the PCL during five out of the seven most recent sampling events. The DRO concentration in MW62 equaled the PCL during the September 2018 sampling event and was below the PCL during both 2019 and 2020 sampling events. Prior to 2018, the last DRO exceedance observed in MW62 was in 2011. RRO has not been detected in either well in since 2016; however, the LOD exceeded the PCL in MW77 in both 2019 and 2020. 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 Isolated Plumes MW62 and MW77



Graph 3-4 RRO Concentrations in Isolated Plumes MW62 and MW77



3.2.3 DRO and RRO in Downgradient Wells

Three monitoring wells located downgradient of the DRO plumes were sampled. The well locations relative to the main and isolated DRO plumes are as follows and are shown on Figure 3-2.

- MW37 is located downgradient of the main DRO plume.
- MW64 is located downgradient of the isolated MW62 DRO plume.
- MW82 is located downgradient of the isolated MW77 DRO plume.

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

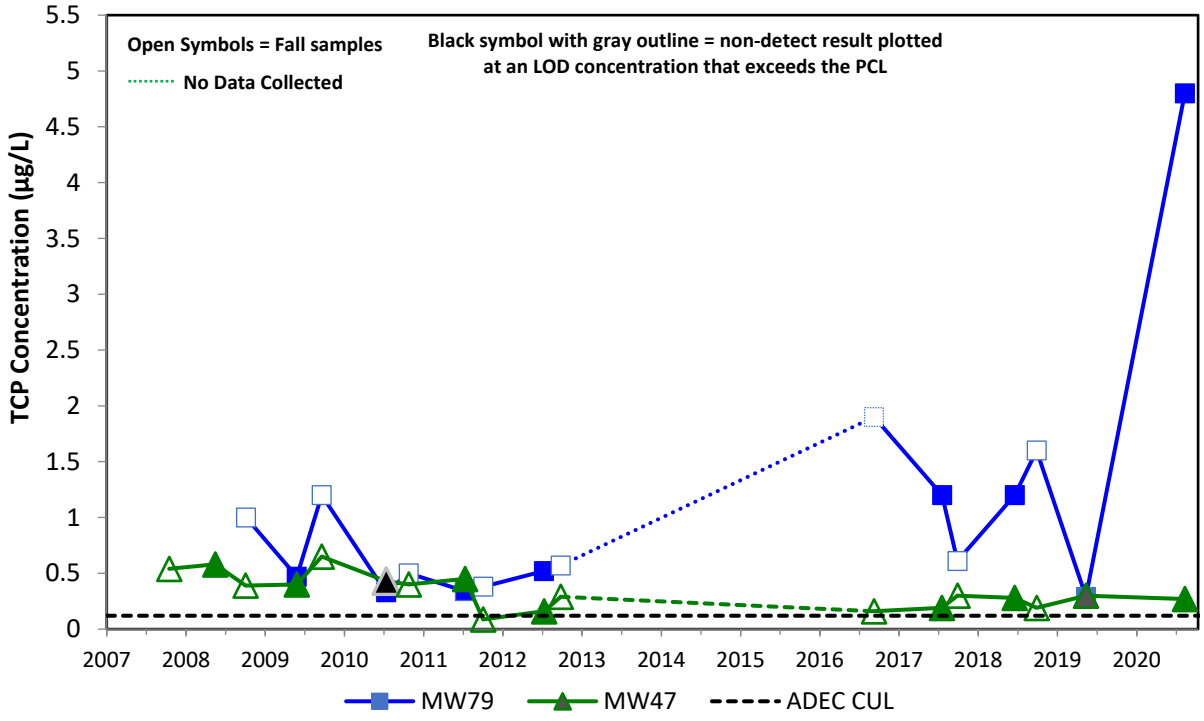
3.3 TCP Plume Sample Results

The TCP plume is characterized by two main source area wells (MW47 and MW79) and one upgradient well (MW08). In addition, one further upgradient background well (MW13) and two downgradient sentry wells (MW78 and MW91) are being monitored for potential TCP contamination. The sentry wells are screened below the water table to evaluate potential diving contaminants that may impact the deep-screened Water Supply Wells (Building 3559). The locations of these wells are shown on Figure 3-3.

TCP has exceeded the PCL (0.12 µg/L) in source area well MW79 during every sampling event since 2008 and in MW47 during every sampling event except in 2011, as shown on Graph 3-5. TCP was detected in MW79 in 2020 at a concentration of 4.8 µg/L, approximately one order of magnitude higher than historical detections. The high TCP concentration observed in MW79 is likely associated with the elevated groundwater levels at the time of sampling. Although TCP exceeds the PCL in MW79 and MW47 in nearly all sampling events, the TCP concentrations in downgradient well MW47 has a decreasing trend, as further discussed in Section 4.3. TCP was not detected in upgradient well MW08 in 2020 and last exceeded the PCL in 2012. TCP has never been detected in downgradient sentry wells MW78 and MW91.

TCP results that have exceeded the PCL between 2007 and 2020 are presented on Figure 3-3; and TCP and MNA parameters for 2018 through 2020 sampling events are presented in Table 3-3 (located at the end of Section 3.0).

Graph 3-5 TCP Concentrations in MW47 and MW79



3.4 TCE Plume Sample Results

Two monitoring wells (MW61 and MW80) were sampled to evaluate the TCE and other chlorinated solvents within the FCS. Well MW80 was screened below the water table to evaluate the vertical profile of TCE contamination. The well locations and TCE results for 2008 through 2020 sampling events are presented on Figure 3-4; and TCE (and associated daughter products) and MNA parameters for 2018 through 2020 sampling events are summarized in Table 3-3 (located at the end of Section 3.0).

TCE concentrations in MW61 have steadily declined since 2007 and last exceeded the PCL (5 µg/L) in October 2010. TCE has never exceeded the PCL in MW80 and was last detected in this well in October 2010, indicating there is not a diving plume present in this area.

TCE reductive dechlorination daughter products, cis-1,2-dichloroethene (DCE), trans-1,2-DCE, and vinyl chloride, were not identified as COCs in the OU6 ROD since groundwater samples did not exceed the Federal Maximum Contaminant Levels (MCLs; EPA 2009) in pre-ROD investigations. These daughter products have previously been detected in well MW61, including detections of both DCE compounds in 2020. However, all detections have remained below MCLs by approximately an order or magnitude.

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 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 summarized in Tables 3-2 and 3-3 (located at the end of Section 3.0). All field parameter results are presented on groundwater sampling forms and Table C-1 included in Appendix C. Laboratory analyses conducted in 2020 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 there is not 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 (located at the end of Section 3.0). For comparison purposes, data associated with background well MW13 is included. Data for background well MW03 is also summarized in the table; however, the data (elevated dissolved iron) suggests that the well does not represent background conditions. The geochemical data indicate that groundwater near MW33 has the strongest reducing conditions, consistent with having the highest DRO concentrations. A summary of the interpretations of the 2020 geochemical data is presented below.

- DO concentrations were relatively low in the DRO plume wells, with the exception of DO measurements inadvertently collected with a malfunctioning DO probe. YSI #6 was used to sample five wells within the DRO plume area on the 12th and 13th of August 2020. DO results ranged from 2.87 and 10.94 mg/L. These results are erroneous and do not represent the geochemical conditions within the DRO plume area. DO concentrations measured by properly functioning YSIs ranged from 0.39 to 2.74 mg/L, with the lowest concentration corresponding to the highest DRO concentration. As a result of the low DO concentrations, aerobic biodegradation is anticipated to be limited.
- ORP values measured across the site were positive in all wells except for MW33, corresponding to the highest DRO concentration. Typically, negative ORP values are also observed in other wells located within the DRO, TCP, and TCE plumes. However, elevated ORP values have been observed Post-wide in 2020 due to high levels of precipitation throughout the spring and summer months. Fluctuating ORP values for groundwater is not uncommon, but the values recorded in 2020 are generally much higher than typically observed. It is suspected that the high amounts of infiltrating positive ORP rainwater affectively elevated the ORP of the relatively shallow water table across FWA.
- Ferrous iron (identified by the dissolved [field-filtered] iron analysis) is a soluble redox indicator produced under reducing conditions. Background dissolved iron concentrations at Fort Wainwright are typically around 1 mg/L. Dissolved iron in main DRO plume wells ranged between 5.07 to 59.8 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 is likely due to biodegradation of fuel constituents (Wiedemeier 1999).
- Manganese, a soluble redox indicator produced under reducing conditions, ranged between 0.692 and 5.62 mg/L in the four main DRO plume wells, while the manganese concentration in background well MW13 was 0.110 J- mg/L. The highest manganese concentrations were detected

in MW33, corresponding to the highest DRO concentration. 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 1999).

- Sulfate, an electron acceptor utilized under strongly reducing conditions, ranged in concentration between 2.9 J and 8.5 mg/L in the four main DRO plume wells, compared to 41.3 mg/L in background well MW13. The lowest sulfate concentration of 2.9 J 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 1999).

3.5.2 Geochemical Conditions in the TCP Plume

Geochemical data for wells associated with the TCP Plume (MW47, MW79, and MW08) are similar to background well MW13, except that DO concentrations in wells MW47 (6.88 mg/L) and MW79 (3.30 mg/L) are higher than typically observed. It is probable that the DO probe malfunctioned; however, the wells sampled before and after these two wells (using the same YSI) had more typical DO concentrations. The reason for the elevated DO concentrations in these wells is unknown.

TCP is a persistent groundwater pollutant that has low abiotic and biotic degradation rates (U.S. Environmental Protection Agency [EPA] 2014a). 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 et al. 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 in the two TCE Plume wells (MW61 and MW80) indicate that groundwater in this area is reduced, creating a favorable environment for reductive dechlorination of TCE. The presence of daughter products cis-1,2-DCE and trans-1,2-DCE in MW61 demonstrate that reductive dechlorination is occurring.

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 (Brice 2020b); Final Postwide UFP-QAPP (Brice 2020a); ADEC Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data Technical Memo (ADEC 2019a); and U.S. Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.3 (DoD 2019).

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 and none of the affected analytes were site COCs. 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.

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Table 3-1 Well Information and Groundwater Elevations

WELL ID	WELL LOCATION RELATIVE TO CONTAMINANT SOURCE	TOTAL WELL DEPTH (feet btoc)	SCREENED INTERVAL (feet btoc)	TOP OF CASING (NAVD88 feet) (surveyed 2019)	26-27 JUNE 2018		20-21 SEPTEMBER 2018		13-14 MAY 2019		11-12 AUGUST 2020	
					WATER LEVEL (feet btoc)	WATER ELEVATION (NAVD88 feet)	WATER LEVEL (feet btoc)	WATER ELEVATION (NAVD88 feet)	WATER LEVEL (feet btoc)	WATER ELEVATION (NAVD88 feet)	WATER LEVEL (feet btoc)	WATER ELEVATION (NAVD88 feet)
BACKGROUND WELLS												
MW03	Background	22.3	12.3-22.3	450.61	14.47	436.14	13.34	437.27	16.17	434.44	13.11	437.50
MW13	Background	19.2	9.2-19.2	452.05	15.14	436.27	14.04	437.37	16.95	435.10	13.83	438.22
DRO PLUME WELLS												
MW06A	Source Area	22.7	12.5-22.5	450.73	14.87	435.95	13.68	437.14	16.55	434.18	13.55	437.18
MW12R	Source Area	22.5	12.4-22.4	447.66	11.68	NA	10.5	NA	13.39	434.27	10.30	437.36
MW33	Source Area	20.9	10.8-20.8	450.64	14.66	435.80	13.48	436.98	16.42	434.22	13.36	437.28
MW37	Downgradient	19.4	9.3-19.3	449.94	14.38	435.63	13.11	436.90	16.02	433.92	13.60	436.34
MW58	Source Area	18.3	8.2-18.2	447.96	12.15	436.49	10.91	437.73	13.82	434.14	11.30	436.66
MW62	Source Area	20.1	10.0-20.0	449.02	13.07	436.04	11.78	437.33	14.76	434.26	11.64	437.38
MW64	Downgradient	20.1	10.0-20.0	449.58	13.64	436.02	12.44	437.22	15.33	434.25	12.30	437.28
MW77	Source Area	22.7	12.6-22.6	452.62	16.91	NA	15.59	NA	18.61	434.01	15.63	436.99
MW82	Downgradient	21.8	11.7-21.7	451.74	16.37	466.31	15.00	467.68	17.99	433.75	15.10	436.64
1,2,3-TCP PLUME WELLS												
MW08	Upgradient	22.2	12.1-22.1	453.61	17.03	436.77	16.04	437.76	18.77	434.84	15.70	437.91
MW47	Source Area	19.8	9.8-19.8	451.27	15.01	436.32	13.98	437.35	16.72	434.55	13.68	437.59
MW79	Source Area	21.6	11.5-21.5	453.45	17.02	NA	16.01	NA	18.79	434.66	15.77	437.68
TCE PLUME WELLS												
MW61	Source Area	20.2	10.1-20.1	449.88	13.77	NA	12.79	NA	15.46	434.42	12.46	437.42
MW80	Upgradient	46.8	26.8-46.8	449.43	13.32	NA	12.33	NA	14.99	434.44	11.96	437.47
SENTRY WELLS												
MW78	Sentry	37.2	27.2-37.2	451.66	15.67	NA	14.43	NA	17.31	434.35	14.27	437.39
MW91	Sentry	76.1	56.0-76.0	451.77	15.97	NA	14.55	NA	17.45	434.32	14.37	437.40

Notes:

For definitions, refer to the Acronyms and Abbreviations section.

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Table 3-2 2018-2020 Groundwater Sample Results - Background and DRO Plume Wells

PLUME/ LOCATION	WELL ID	DATE	GEOCHEMICAL PARAMETERS					ROD ANALYTES	
			DISSOLVED OXYGEN (mg/L)	ORP (mv)	DISSOLVED IRON (mg/L)	DISSOLVED MANGANESE (mg/L)	SULFATE (mg/L)	DRO (µg/L)	RRO (µg/L)
PROJECT CLEANUP LEVEL[1]			**NE**	**NE**	**NE**	**NE**	**NE**	**1,500**	**1,100**
Background	MW03	6/20/2018	0.61	-74.3	14.1	0.916	43.0	230	ND(200)
		9/21/2018	1.42	-92.0	12.5	0.798	44.2	270	ND(200)
		5/13/2019	0.55	-63.9	12.7	0.745	50.7	300 B	180 J,B
		8/11/2020	0.65	41.2	13.4	0.763	14.4	ND(50)	ND(200)
	MW13[3]	6/25/2018	2.32	31.6	1.00	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
		8/12/2020	0.91	198.9	0.238	0.110	41.3	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	9.90	0.906	35.4	330 B	160 J,B
		8/13/2020	2.87	109.3	9.55	0.916	8.5	ND(50)	ND(200)
	MW33	6/20/2018	0.54	-132.0	45.9	3.17	4.0	**25,000**	ND(4,000)
		6/20/2018[2]			43.8	2.96	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)
		9/26/2018[2]			42.7	3.38	7.0	**43,000**	ND(4,000)
		5/14/2019	0.41	-109.4	43.4	2.88	4.5	**69,000 J**	ND(20,000)
		5/14/2019[2]			45.0	3.06	4.1	**95,000 J**	ND(20,000)
		8/12/2020	0.39	-29.7	59.8	5.69	2.9	**45,000**	**5,700 J**
		8/12/2020[2]			58.7	5.62	5.8	**55,000**	**6,300 J**
	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)
		8/12/2020	1.28	134.1	17.7	1.18	4.9	**4,100**	ND(1,000)
	MW58	6/21/2018	1.63	-68.5	14.0	1.13	16.8	**2,300**	ND(400)
		6/21/2018[2]			12.4	1.10	17.3	**2,500**	ND(400)
		9/27/2018	1.60	-108.5	15.9	1.13	19.2	**3,000**	ND(200)
		9/27/2018[2]			16.0	1.14	19.2	**3,600**	ND(200)
		5/16/2019	0.68	-67.5	17.5	1.10	15.8	**4,500**	320 J,B
		5/16/2019[2]			17.4	1.06	15.7	**4,500**	530 J,J+,B
		8/12/2020	7.04	140.7	5.07	0.692	7.5	1,400	240 J
	MW37 (downgradient)	6/21/2018	1.17	97.70	ND(0.03)	0.159	29.1	1,000	ND(200)
		9/26/2018	1.34	68.10	ND(0.03)	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
		8/12/2020	6.33	140.8	0.0585 B	0.0380	32.2	290	ND(200)
Isolated DRO Plumes	MW62	6/21/2018	0.38	14.5	1.46	1.39	46.0	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
		8/12/2020	0.95	100.1	0.026 B,J	0.832	27.8	250	ND(200)
	MW64 (downgradient of MW62)	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)
		8/13/2020	10.94	123.7	0.0585 B	0.0379	32.2	290	ND(200)
	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(0.03)	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)
		8/12/2020	2.74	155.7	0.0214 B,J	0.617	45.9	**5,000**	ND(2,000)
	MW82 (downgradient of MW77)	6/21/2018	1.87	126.1	ND(0.03)	0.0875	33.2	140	ND(200)
		9/27/2018	1.57	61.10	ND(0.03)	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
		8/12/2020	5.16	148.8	0.0607 B	0.0250	11.2	ND(50)	ND(200)

Notes:

For definitions, refer to Acronyms and Abbreviations section

Red and bold results exceed PCLs

Gray shaded results are non-detect with LODs that exceed the PCL

[1] PCL established in the OU6 ROD

[2] Sample is a field duplicate of the sample immediate above.

[3] Background well MW13 is included with the DRO plume wells for comparison of background geochemical parameters.

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 parentheses)

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Table 3-3 2018-2020 Groundwater Sample Results - TCP and TCE Plume Wells

PLUME/ LOCATION	WELL ID	DATE	GEOCHEMICAL PARAMETERS					ROD ANALTYES		NON-ROD ANALYTES (TCE DEGRADATION PRODUCTS)		
			DISSOLVED OXYGEN (mg/L)	ORP (mv)	DISSOLVED IRON (mg/L)	DISSOLVED MANGANESE (mg/L)	SULFATE (mg/L)	TCP (µg/L)	TCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)
PROJECT CLEANUP LEVEL[1,2]			**NE**	**NE**	**NE**	**NE**	**NE**	**0.12**	**5**	**70[2]**	**100[2]**	**2[2]**
Background	MW13	6/25/2018	2.32	31.6	1	0.323	39.8	ND(0.005)	NA	NA	NA	NA
		9/21/2018	0.60	57.2	0.455	0.0851	57.0	ND(0.005)	NA	NA	NA	NA
		5/13/2019	0.72	32.9	1.86	0.744	41.1	ND(0.005)	NA	NA	NA	NA
		8/12/2020	0.91	198.9	0.238	0.110	41.3	ND(0.005)	NA	NA	NA	NA
TCP Plume	MW47	6/22/2018	1.94	81.8	0.0380 J	0.0211	37.1	**0.28**	NA	NA	NA	ND(0.02)
		6/22/2018[3]			ND(0.04)	0.0189	35.9	**0.28**	NA	NA	NA	ND(0.02)
		9/21/2018	4.23	53.2	ND(0.03)	0.0295 J+	39.5	**0.19**	NA	NA	NA	ND(0.02)
		9/21/2018[3]			ND(0.03)	0.0311 J+	39.4	**0.20**	NA	NA	NA	ND(0.02)
		5/13/2019	1.01	144.1	0.0483 J	0.148	36.7	**0.30**	NA	NA	NA	ND(0.02)
		5/13/2019[3]			0.0353 J	0.146	32.6	**0.31**	NA	NA	NA	ND(0.02)
		8/11/2020	6.88	114.8	ND(0.03) J-	0.004	39.9	**0.27**	NA	NA	NA	ND(0.02)
	MW79	6/20/2018	1.40	-21.2	3.34	0.612	30.9	**1.2**	NA	NA	NA	ND(0.02)
		9/26/2018	1.51	-8.7	1.88	0.496	42.3	**1.6**	NA	NA	NA	ND(0.02)
		5/14/2019	0.82	-55.8	10.6	0.793	29.2	**0.29**	NA	NA	NA	ND(0.02)
		8/11/2020	3.30	130.6	0.682	0.446	57.6	**4.8**	NA	NA	NA	ND(0.02)
	MW08	6/20/2018	1.39	117.1	ND(0.03)	0.0047 J	31.8	ND(0.005)	NA	NA	NA	ND(0.02)
		9/26/2018	1.66	123.6	ND(0.03)	0.0026 J,B	31.9	0.062	NA	NA	NA	ND(0.02)
		5/13/2019	2.21	141.8	0.0146 J	0.0141	40.0	ND(0.005)	NA	NA	NA	ND(0.02)
		8/11/2020	1.92	140.2	ND(0.03) J-	0.0081	42.7	ND(0.005)	NA	NA	NA	ND(0.02)
TCE Plume	MW61	6/22/2018	0.84	26.9	12.2	1.87	40.5	ND(1.0)	0.73 J	5.0	5.9	ND(0.3)
		6/22/2018[3]			NA	NA	NA	ND(1.0)	0.79 J	4.5	6.2	ND(0.3)
		9/21/2018	1.58	-58.5	9.19	2.07	44.5	ND(1.0)	1.0 J-	6.7 J-	6.2 J-	ND(0.3)
		9/21/2018[3]			NA	NA	NA	ND(1.0)	0.99 J	5.9	5.5	ND(0.3)
		5/14/2019	0.43	-68.4	10.5	1.44	40.2	ND(0.005)	NA	NA	NA	0.42
		5/14/2019[3]			NA	NA	NA	ND(0.005)	NA	NA	NA	0.40
		8/27/2019	0.75	-56.6	NA	NA	NA	ND(1.0)	ND(0.3)	6.1 J+	6.5 J+	ND(0.3)
		8/27/2019[3]			NA	NA	NA	ND(1.0)	0.67 J,J+	6.9 J+	7.0 J+	ND(0.3)
		8/11/2020	0.90	131.1	6.21	1.11	46.9	ND(0.005)	ND(0.3)	4.5	4.8	ND(0.02)
		8/11/2020[3]			6.37	1.12	42.1	ND(0.005)	1.3	4.6	5.0	ND(0.02)
	MW80	6/21/2018	0.40	-5.80	10.3	0.833	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	0.812	31.8	ND(0.005)	NA	NA	NA	ND(0.02)
		8/27/2019	0.38	-112.1	NA	NA	NA	ND(1.0)	ND(0.3)	ND(0.3)	ND(0.3)	ND(0.02)
		8/11/2020	0.65	109.0	9.30	0.754	32.1	ND(0.005)	ND(0.3)	ND(0.3)	ND(0.3)	ND(0.02)
Sentry Wells	MW78	6/22/2018	0.94	-150.2	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)
		9/20/2018	1.51	-127.6	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)
		5/13/2019	0.37	-110.0	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)
		8/11/2020	0.89	135.4	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)
	MW91	6/25/2018	0.63	-159.2	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)
		9/21/2018	0.55	-118.9	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)
		5/13/2019	0.73	-120.2	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)
		8/11/2020	0.90	122.5	NA	NA	NA	ND(0.005)	NA	NA	NA	ND(0.02)

Notes:
For definitions, refer to Acronyms and Abbreviations section
Red and bold results exceed PCLs
Gray shaded results are non-detect with LODs that exceed the PCL

[1] PCL established in the OU6 ROD

[2] Non-ROD analytes (vinyl chloride; cis-1,2-DCE; and trans-1,2-DCE) are TCE reductive dechlorination daughter products and are compared to EPA MCLs.

[3] Sample is a field duplicate of the sample immediate above.

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 parentheses)

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4.0 CONTAMINANT TREND AND PLUME ANALYSIS

This section presents a summary of the contaminant trends and plume analysis. Current and historical data were used to support statistical analysis using the Monitoring and Remediation Optimization System (MAROS) software and EPA Groundwater Statistics Tool, along with geometric regression plots. The complete results of the statistical analysis are presented in Appendix E.

4.1 Statistical Evaluation of Contaminant Concentration Trends

Groundwater monitoring data collected between 2007 and 2020 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 (USAG 2014). 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 Environmental Excellence (AFCEE; AFCEE 2006).

The Groundwater Statistics Tool developed by the EPA (EPA 2014b) was used to evaluate 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. Geometric regression plots were completed using Microsoft Excel, and the plots provided a visual representation of the trends and another estimate of the time anticipated to achieve the PCL based on the 95% UCL. 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: 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	RELATIVE PLUME LOCATION	ANALYTE	MANN-KENDALL STATISTIC	COEFFICIENT OF VARIATION	TREND CONFIDENCE	MANN-KENDALL TREND[1]
MAIN DRO PLUME WELLS						
MW12R	Upgradient	DRO	-55	0.86	98.0%	Decreasing (Probably Decreasing)
		RRO	-23	1.19	79.5%	No Trend
MW33	Source Area	DRO	71	0.74	99.7%	**Increasing**
		RRO	74	0.91	100%	**Increasing**
MW06A	Downgradient	DRO	-2	0.54	51.4%	**Stable (No Trend)**
MW58	Downgradient	DRO	5	0.40	55.9%	No Trend
ISOLATED DRO PLUME WELLS						
MW62	Source Area	DRO	30	2.40	86.2%	No Trend
		RRO	18	2.31	73.8%	No Trend
MW77	Source Area	DRO	31	1.36	89.0%	**No Trend**
		RRO	-33	1.32	90.5%	Probably Decreasing (No Trend)

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
BOLD indicates the concentration was above the PCL in 2020 (or 2019).
[1] The previous year trend is shown in parenthesis if there was a change.

The Mann-Kendall trend results in the main DRO plume wells show a decreasing trend for DRO in the upgradient well (MW12R), an increasing trend in the main source area well (MW33), and stable and no trend in the downgradient wells (MW06A and MW58, respectively). 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 liquid (NAPL) in the soil that continues to be solubilized in the groundwater. MW06A, located immediately downgradient of MW33, had a stable trend (change from no trend the previous year) with DRO concentrations consistently above the PCL. MW58 is downgradient from MW06A, and the DRO concentrations exhibit no trend, with variable detections above and below the PCL since 2007 (the 2020 result was below the PCL). Although not shown in Table 4-1, the DRO detections in further downgradient well MW37 are consistently below the PCL. This provides evidence that the main DRO plume is not expanding.

The RRO concentration trends in the main DRO plume wells are similar to the DRO trends, with an increasing trend observed in source area well MW33. RRO also consistently exceeds the PCL in this well, with the highest concentration to date observed in the 2020 sampling event. RRO is either not detected or detected at trace concentrations in the upgradient and downgradient wells.

The DRO concentrations exhibit no trend in the isolated DRO plume wells (MW62 and MW77). In MW62, DRO and RRO have been detected at or below the PCL in nine consecutive sampling events (including 2020). 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.

The DRO concentrations in MW77 exhibit no trend, but have remained above the PCL for four consecutive sampling events between 2018 and 2020. This is the longest string of consecutive sampling events with DRO exceedances; however, the DRO concentrations in downgradient well MW82 remain below the PCL.

Mann-Kendall trends for RRO in MW62 and MW77 show trends of no trend and probably decreasing, respectively. However, RRO is not typically detected in these wells.

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 Mann-Kendall trend analysis. The results of the analysis are summarized in Table 4-2, and the complete results are presented in Appendix E.

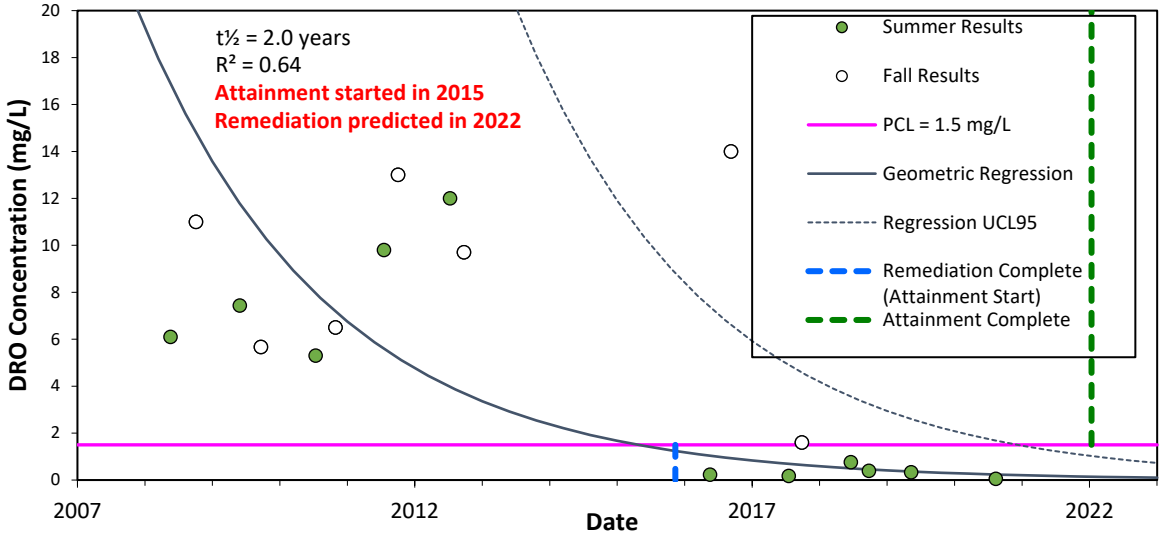
Table 4-2 Statistical Evaluation of DRO in MW12R

WELL ID	TREND RESULT	NUMBER OF DATA POINTS	95% UCL (mg/L)	HAS PCL BEEN ACHIEVED?	YEAR EXPECTED TO ACHIEVE PCL BASED ON 95% UCL? ("Attainment Complete")[1]
MW12R	Decreasing	18	10.9	No	2022

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
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 on 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 in 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. For consistency with this assumption, the monitoring well network used for the 2020 sampling event was used to evaluate plume trends. This includes the main DRO plume wells (MW06A, MW12R, MW33, and MW58) and surrounding wells (MW37, MW64, and MW82). 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)	Probably Increasing
Second Moment (Plume Spread)	
Parallel to Groundwater Flow	Stable
Perpendicular to Groundwater Flow	No Trend

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[1] Based on monitoring results between 2016 and 2020.

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 a probably increasing trend in the distance from the source to the center of mass since 2016. However, this trend appears to be significantly influenced by the estimate of the center of mass location based on the September 2016 results. Between 2017 and 2020 the center of mass has varied between 183 and 214 feet from the source.

The second moment results indicate a stable 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 in all wells but MW33, for which quarterly sampling was recommended. 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 2018). 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. The groundwater elevations in 2020 were significantly higher than the 2019 sampling event, and in general, DRO concentrations were lower in 2020. Despite seasonal effects on DRO in MW33, continued annual sampling for all wells is recommended and will be sufficient for decision making at the site.

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. Complete results of the trend analysis are presented in Appendix E.

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

WELL ID	RELATIVE PLUME LOCATION	ANALYTE	MANN-KENDALL STATISTIC	COEFFICIENT OF VARIATION	TREND CONFIDENCE	TREND
MW47	Downgradient	TCP	-50	0.57	97.9%	**Decreasing**
MW79	Source Area	TCP	36	1.11	94.2%	**Probably Increasing (No Trend)**

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
BOLD indicates the concentration was above the PCL in 2020 (or 2019).
[1] The previous year trend is shown in parenthesis if there was a change.

The trend results show the TCP concentration is decreasing in downgradient well MW47 and exhibits a probably increasing trend in well MW79. Concentrations were above the PCL in both wells during 2020, 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. The 2020 TCP result in MW79 was the highest concentration observed at the site, and was likely associated with the high groundwater elevations.

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.

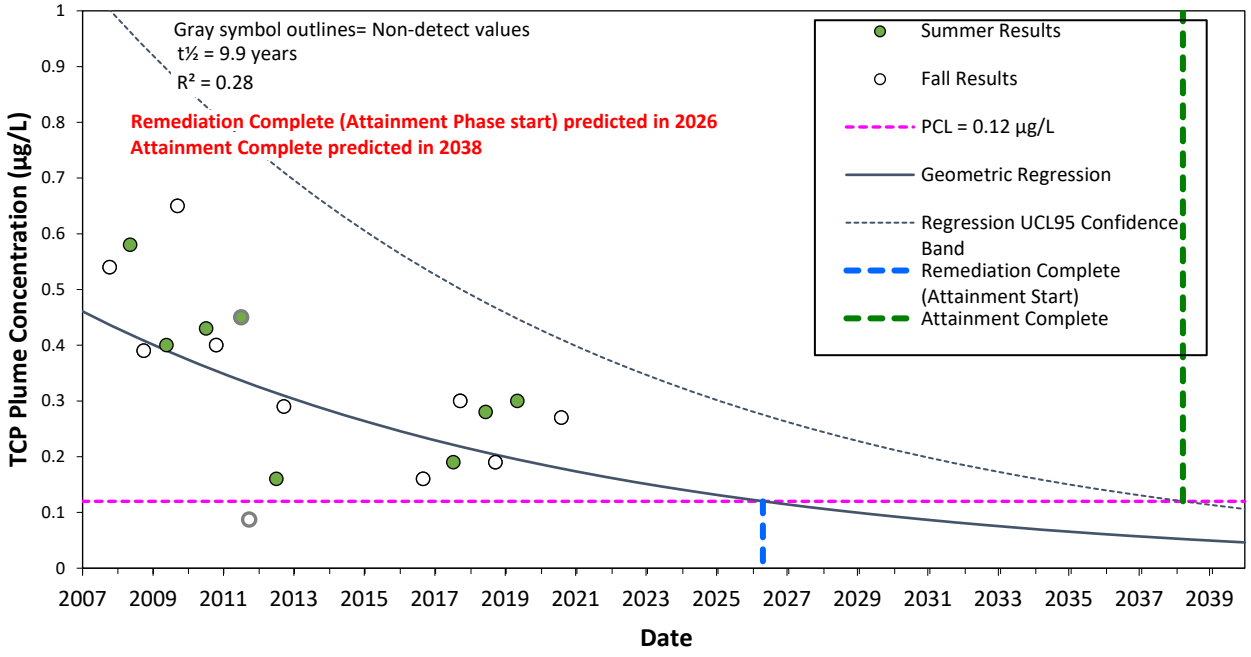
Table 4-5 Statistical Evaluation of TCP in MW47 and MW08

WELL ID	TREND RESULT	NUMBER OF DATA POINTS	95% UCL (µg/L)	HAS PCL BEEN ACHIEVED?	YEAR EXPECTED TO ACHIEVE PCL BASED ON 95% UCL? ("Attainment Complete")[1]
MW47	Decreasing	17	0.50	No	2038
MW08	Decreasing	15	0.12	No	2024

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
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) for MW47. The plot for MW08 was constructed but not shown for simplicity.

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 (geometric regression plot not shown).

Graph 4-2 Geometric Regression of TCP Concentrations in MW47



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. Complete results of the trend analysis are presented in Appendix E.

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	-120	0.98	100.0%	Decreasing

Notes:
For definitions, refer to the Acronyms and Abbreviations section.

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.

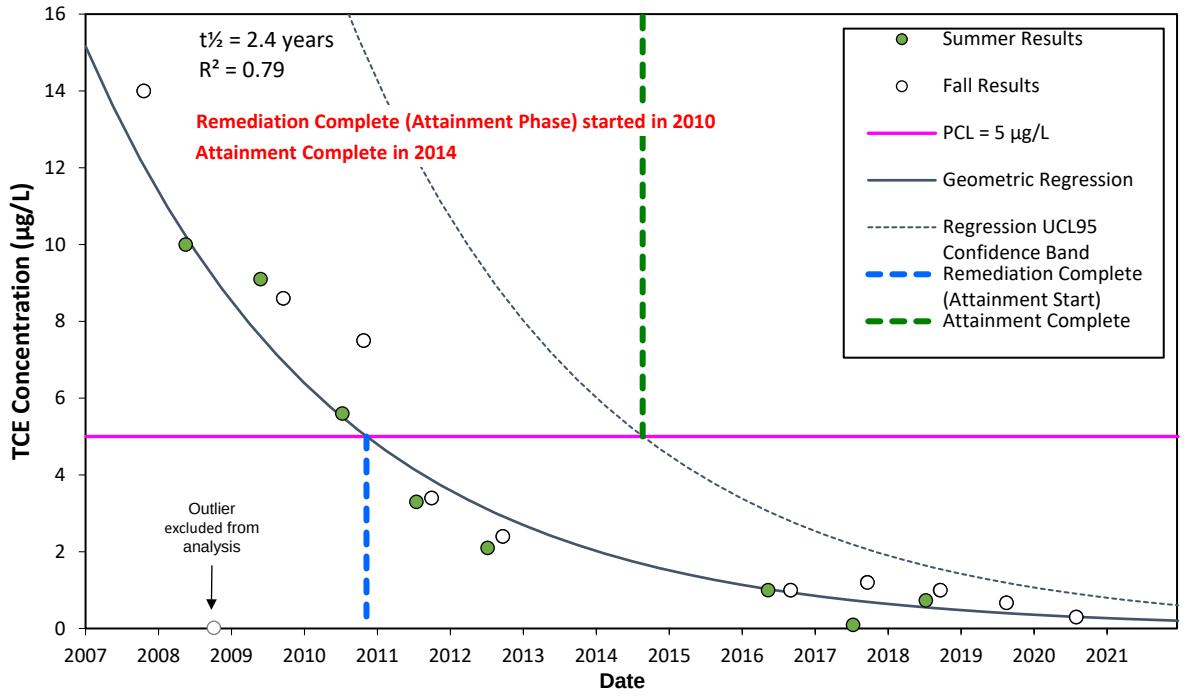
Table 4-7 Cleanup Complete Evaluation for TCE in MW61

WELL ID	TREND RESULT	NUMBER OF DATA POINTS[1]	95% UCL (µg/L)	95% UCL VALUE[2]	ACHIEVE PCL?
MW61	Decreasing	12	2.81	0.99	Yes

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
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 a decreasing trend is observed. 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 2014b).

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 isolated MW62 and MW77 DRO plumes, the TCP plume, and the TCE plume. Groundwater monitoring results between 2007 and 2020 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 recommendations for future groundwater sampling activities.

5.1 DRO Plume Summary

In general, DRO concentrations within the main DRO plume were lower in 2020 compared to 2019, most likely the result of higher groundwater elevations encountered during the 2020 groundwater sampling event. An evaluation of the DRO contaminant trends shows that DRO concentrations at the edges of the main plume are stable. 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 iron and manganese, and lower concentrations of sulfate, are evidence that metal and sulfate reduction are significant biodegradation processes in the main DRO plume source area. An estimation of the time to cleanup could only be determined for slightly upgradient well MW12R (expected 2022) as it was the only well associated with the main DRO plume that had a decreasing trend. When NAPL within the main DRO plume is depleted and no longer generates dissolved contaminant concentrations, decreasing trends in other wells 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 did not exceed the PCL in 2020 and has only exceeded the PCL once since 2012. Assuming the DRO remains below the PCL in MW62 in 2021, the cleanup attainment timeframe could be calculated following the EPA guidance (EPA 2014b). DRO concentrations in MW77, while highly variable, exceeded the PCL in recent 2018, 2019, and 2020 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 a probably increasing trend. The change in trend from no trend to probably increasing between 2019 and 2020 was a result of the significantly elevated 2020 TCP concentration. This concentration was more than two times higher than the maximum detection between 2008 and 2019, and was likely a result of the high groundwater elevations. TCP has remained below the PCL in surrounding wells, suggesting minimal plume spread from the source area has occurred. 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 2014b). Although TCE has statistically achieved attainment, monitoring for reductive dechlorination daughter products should be continued.

5.4 Recommendations

No changes to the current monitoring well network or analytical program are recommended for 2021. Continued use of an analytical method that can achieve an LOD below the ADEC cleanup level for vinyl chloride is essential to further evaluate reductive dechlorination of TCE in the TCE plume wells.

6.0 REFERENCES

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FIGURES

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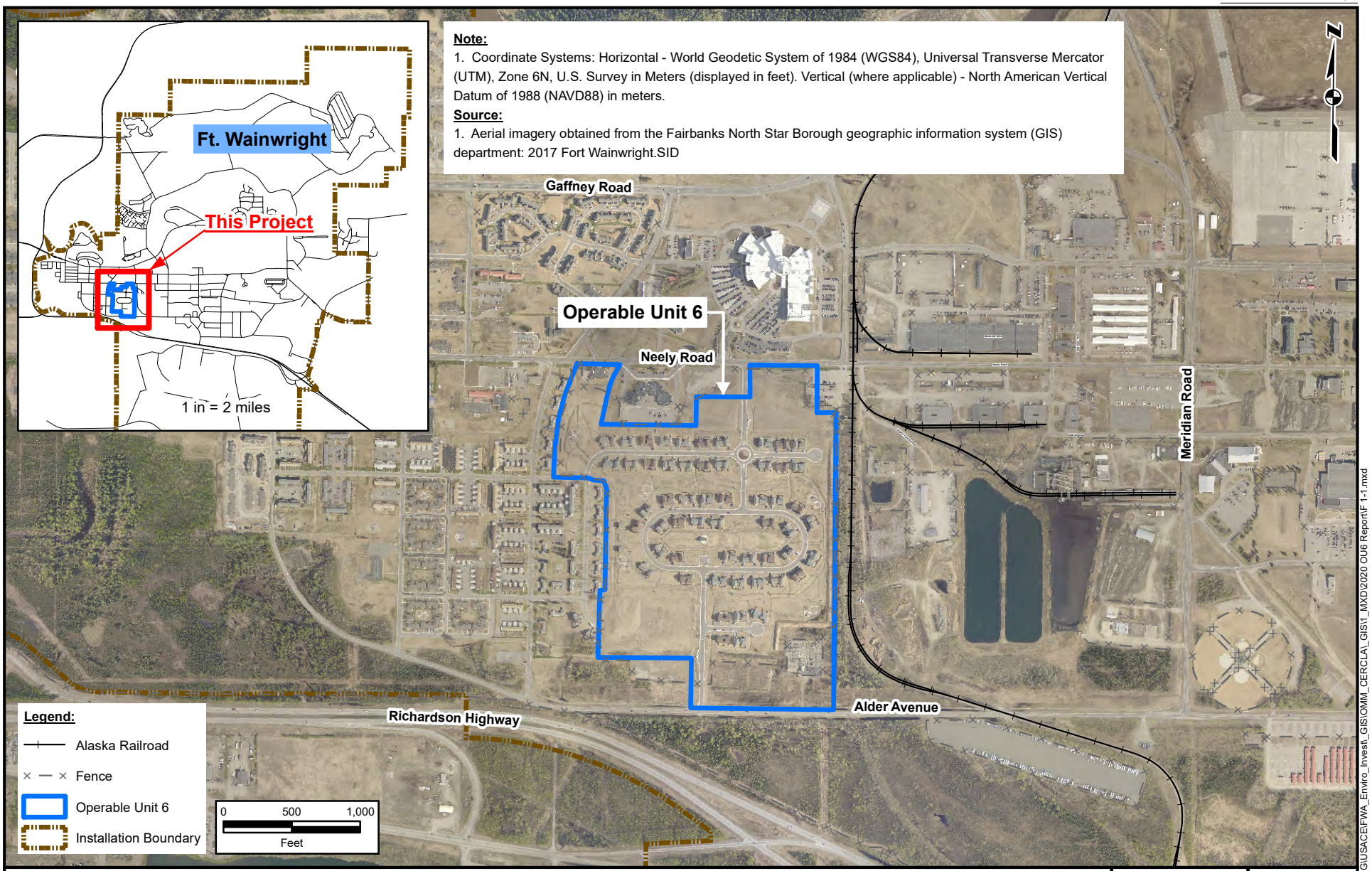
1 INCH



2020 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

SITE LOCATION AND VICINITY

DATE: 12/28/2020

Project No.: 551209

P.M. / DRAWN V.R. / C.B.

FIGURE: 1-1

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1 INCH

N

Bassett Army Hospital

9th Street

10th Street

Neely Road

Hackberry Street

MW82

MW37

MW77

MW58

MW06A

MW64

MW62

MW33

MW12R

MW61

MW80

MW03

MW13

Main DRO Plume Wells

Isolated DRO Plumes

TCE Plume Wells

Backup Water Supply Well (Building 3563)

Water Supply Well (Building 3559)

Approximate Groundwater Flow Direction

Sentry Wells

MW78

MW91

TCP Plume Wells

MW47

MW79

MW08

4723

4713

4711

4709

4707

4712

4743

4741

4755

4744

4745

Tanana Trails Subdivision

Legend:

- DRO Plume Well
- TCE Plume Well
- TCP Plume Well
- Sentry Well
- Background Well
- Railroad
- Fence
- Building with Observed Debris Beneath Foundation
- Building with Observed Possible Debris Beneath Foundation

Note:

1. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet). Vertical (where applicable) - North American Vertical Datum of 1988 (NAVD88) in meters.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough geographic information system (GIS) department: 2017 Fort Wainwright.SID

0 105 210
Feet

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2020 OPERABLE UNIT 6 MONITORING REPORT
U.S. ARMY GARRISON ALASKA

GROUNDWATER MONITORING WELLS SAMPLED IN 2020

PROJECT No.: 551209
DATE: 5/26/2021
P.M./DRAWN: V.R. / C.B.

FIGURE: **2-1**

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1 INCH

Bassett Army Hospital

9th Street

10th Street

Neely Road

Hackberry Street

MW82 436.23

MW37 436.46

MW77 436.59

MW58 436.73

MW06A 436.79

MW64 436.85

MW62 436.90

MW33 436.86

MW12R 436.92

MW61 437.01

MW80 437.05

MW91 436.98

MW78 437.04

MW47 437.23

MW79 437.31

MW08 437.55

MW03 437.10

MW13 437.82

436.40

436.60

436.80

437.00

437.20

437.40

437.60

437.80

Backup Water Supply Well (Building 3563)

Water Supply Well (Building 3559)

Approximate Groundwater Flow Direction

Tanana Trails Subdivision

Notes:

1. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet). Vertical (where applicable) - North American Vertical Datum of 1988 (NAVD88) in feet.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough geographic information system (GIS) department: 2017 Fort Wainwright.SID

Legend:

- Monitoring Well Sampled in 2020 - Groundwater Elevation in NAVD88, Feet
- 437.80 Groundwater Elevation Contour - 8 September 2020, Contour Interval = 0.2 feet
- Railroad
- Fence

0 105 210 Feet

2020 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

GROUNDWATER ELEVATION CONTOURS

PROJECT No.: 551209

DATE: 3/5/2021

P.M./DRAWN: V.R. / C.B.

FIGURE: 3-1

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1 INCH

N

Bassett Army Hospital

9th Street

MW82

MW77	Oct-08	Jun-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Jul-12	Sep-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*434.01*	*436.99*
DRO	**2,700**	1,100	271	**1,800**	1,000	**1,600**	**4,200**	710	460	1,200	**20,000**	280	640	**7,800**	**4,600**	**7,800**	**5,000**
RRO	ND(560)	322	ND(144)	610	310	710	210	200	64	300	**1,800**	ND(110)	240	ND(1,000)	ND(200)	ND(2,000)*	ND(2,000)*

MW58	Oct-07	May-08	Oct-08	Jun-09	Sep-09	Jul-10	Oct-10	Jul-11	Jul-12	Sep-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*436.49*	*437.73*	*434.14*	*436.66*
DRO	**3,200**	**2,200**	1,000	**2,250**	**2,830**	**3,300**	1,200	**2,200**	**2,600**	**2,000**	**2,700**	800	**2,000**	**2,100**	**2,300**	**3,000**	**4,500**	1,400
RRO	200	ND(94)	100	ND(150)	ND(144)	610	170	520	270	140	310	240	ND(220)	240	ND(400)	ND(200)	530	240

Neely Road

MW37

MW77

Isolated DRO Plume

MW33									
Date	**Oct-07**	**May-08**	**Oct-08**	**May-09**	**Sep-09**	**Jul-10**	**Oct-10**	**Jul-11**	**Oct-11**
GW Elev (ft)	-	-	-	-	-	-	-	-	-
DRO	**28,000**	**10,000**	**29,000**	**13,200**	**13,000**	**10,000**	**31,000**	**6,700**	**22,000**
RRO	ND(840)	ND(1,900)*	ND(4,300)*	**1,120**	**1,490**	400	**2,100**	**1,100**	**3,200**
Date	**Sep-12**	**May-16**	**Sep-16**	**Jul-17**	**Sep-17**	**Jun-18**	**Sep-18**	**May-19**	**Aug-20**
GW Elev (ft)	-	-	-	-	-	*435.80*	*436.98*	*434.22*	*437.28*
DRO	**19,000**	**34,000**	**76,000**	**35,000**	**25,000**	**25,000**	**39,000**	**95,000**	**55,000**
RRO	**1,200**	**2,300**	**4,700**	**4,000**	ND(5,500)*	ND(4,000)*	ND(4,000)*	ND(20,000)*	**6,300**

Main DRO Plume Wells

MW58

MW06A

MW64

MW62

Isolated DRO Plume

MW33

MW12R

Approximate Groundwater Flow Direction

MW47

MW61

MW80

MW06A										
Date	**Oct-07**	**May-08**	**Oct-08**	**May-09**	**Sep-09**	**Jul-10**	**Oct-10**	**Jul-11**	**Oct-11**	**Jul-12**
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-
DRO	**8,200**	**5,500**	**4,500**	**3,040**	**4,980**	**9,000**	**7,200**	**3,200**	**5,200**	**7,600**
RRO	ND(1,800)*	ND(1,800)*	ND(960)	ND(156)	ND(147)	**1,100**	330	580	510	580
Date	**Sep-12**	**May-16**	**Sep-16**	**Jul-17**	**Sep-17**	**Jun-18**	**Sep-18**	**May-19**	**Aug-20**	
GW Elev (ft)	-	-	-	-	-	*435.95*	*437.14*	*434.18*	*437.18*	
DRO	**4,800**	**6,600**	**4,900**	**3,900**	**5,000**	**5,300**	**5,300**	**18,000**	**4,100**	
RRO	330	490	630	ND(550)	320	ND(1,000)	ND(400)	ND(4,000)*	ND(1,000)	

MW12R	May-08	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Jul-12	Oct-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*434.27*	*437.36*
DRO	**6,100**	**11,000**	**7,430**	**5,670**	**5,300**	**6,500**	**9,800**	**13,000**	**12,000**	**9,700**	230	**14,000**	170	**1,600**	760	290	330	ND(50)
RRO	ND(1,800)*	ND(2,000)*	406	257	150	290	**1,300**	**1,300**	710	400	66	**1,600**	ND(1,000)	180	ND(200)	ND(200)	160	ND(200)

Tanana Trails Subdivision

MW03

MW62	Oct-07	May-08	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Oct-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*436.04*	*437.33*	*434.26*	*437.38*
DRO	61	41	**7,700**	ND(250)	ND(245)	380	**29,000**	220	**18,000**	140	100	97	92	180	310	**1,500**	450	250
RRO	40	ND(94)	ND(950)	ND(150)	ND(147)	290	**4,600**	250	**5,000**	90	120	82	ND(110)	180	ND(200)	ND(200)	310	ND(200)

MW13

Notes:

1. Results shown in **red** equal or exceed the PCL.
2. The numeric remedial goals presented in this figure are based on the remedial action objectives described in the OU6 ROD.
3. * The result is ND with an LOD greater than the PCL.
4. Analytical results shown in µg/L.
5. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
6. Only sample results for wells that have exceeded the PCL since 2007 are shown.
7. Data flags (qualifiers) are not shown due to space limitations.
8. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet). Vertical (where applicable) - North American Vertical Datum of 1988 (NAVD88) in feet.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough geographic information system (GIS) department: 2017 Fort Wainwright.SID

PCL (µg/L)	
DRO	1,500
RRO	1,100

Acronyms and Abbreviations

bgs - below ground surface
DRO - Diesel Range Organics
LOD - Limit of Detection
ND - Not Detected (LOD presented in parenthesis)
PCL - Project Cleanup Level
RRO - Residual Range Organics
ROD - Record of Decision
µg/L - micrograms per liter

Legend:

Monitoring Well Sampled in 2020 (Non DRO Plume Well)

DRO Plume Monitoring Well Sampled in 2020

Fence

0 90 180
Feet

2020 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

DRO PLUME GROUNDWATER SAMPLE RESULTS

PROJECT No.: 551209

DATE: 3/5/2021

P.M./DRAWN: V.R. / C.B.

FIGURE: **3-2**

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1 INCH

Bassett Army Hospital

MW82

Neely Road

MW37

MW77

Water Supply Well (Building 3559)

MW58

MW06A

MW64

MW47	Oct-07	May-08	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Jun-12	Sep-12	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*436.32*	*437.35*	*434.55*	*437.59*
TCP	0.54	0.59	0.50	0.51	0.65	0.43	0.40	ND(0.5)*	0.087	0.59	0.29	0.16	0.19	0.30	0.28	0.20	0.31	0.27

MW62

MW33

MW12R

MW61

MW80

MW78

MW91

MW47

Approximate Groundwater Flow Direction

MW79

TCP Plume Wells

MW79	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Jun-12	Sep-12	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*434.66*	*437.68*
TCP	1.0	0.47	1.2	0.33	0.50	0.34	0.38	0.52	0.57	1.9	1.2	0.61	1.2	1.6	0.29	4.8

MW08

Tanana Trails Subdivision

MW08	Oct-07	May-08	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Jul-12	Sep-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*436.77*	*437.76*	*434.84*	*437.91*
TCP	ND(0.3)*	0.023	0.23	0.024	0.034	ND(0.3)*	ND(0.5)*	ND(0.5)*	0.057	0.13	ND(0.5)*	ND(0.1)	0.030	0.027	0.031	ND(0.005)	0.062	ND(0.005)	ND(0.005)

MW13	Oct-07	May-08	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Oct-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	May-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*436.27*	*437.37*	*435.10*	*438.22*
TCP	ND(0.3)*	0.21	ND(0.01)	ND(0.01)	ND(0.01)	ND(0.3)*	ND(0.5)*	ND(0.5)*	ND(0.5)*	ND(0.5)*	ND(0.1)	ND(0.04)	ND(0.003)	ND(0.003)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)

MW13**

Notes:

1. Results shown in **red** equal or exceed the PCL.
2. The PCL values presented in this figure are based on the remedial action objectives described in the OU6 ROD.
3. *The result is ND with an LOD greater than the PCL.
4. **MW13 is not designated as a TCP plume well; however, results are shown because TCP has historically been detected.
5. Analytical results shown in µg/L.
6. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
7. Data flags (qualifiers) are not shown due to space limitations.
8. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet). Vertical (where applicable) - North American Vertical Datum of 1988 (NAVD88) in feet.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough geographic information system (GIS) department: 2017 Fort Wainwright.SID

Legend:

- TCP Plume Monitoring Well Sampled in 2020
- Sentry Well Sampled for TCP in 2020
- Monitoring Well Sampled in 2020 (Non TCP Plume Well)
- Railroad
- Fence

Acronyms and Abbreviations

bgs - below ground surface
LOD - Limit of Detection
ND - Not Detected (LOD presented in parenthesis)
PCL - Project Cleanup Level
ROD - Record of Decision
TCP - 1,2,3-Trichloropropane
µg/L - micrograms per liter

PCL (µg/L)	
TCP	0.12

0 90 180
Feet

2020 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

TCP PLUME GROUNDWATER SAMPLE RESULTS

PROJECT No.: 551209

DATE: 3/5/2021

P.M./DRAWN: V.R. / C.B.

FIGURE: 3-3

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2020 OU6 Report\F 3-3.mxd

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1 INCH

Bassett Army Hospital

Neely Road

MW82 MW37 MW77 MW58 MW06A MW64 MW62 MW33 MW12R MW61 MW80 MW91 MW78 MW47 MW79 MW08 MW13

TCE Plume Wells

Approximate Groundwater Flow Direction

Tanana Trails Subdivision

MW61	Oct-07	May-08	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Jun-12	Sep-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	Aug-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*437.42*
TCE	**14.0**	**10.0**	ND(0.01)	**9.1**	ND(9.1)	**5.6**	**7.5**	3.3	3.4	2.1	2.4	1.0	1.0	0.94	1.2	0.79	1.0	0.67	1.3

MW80	Oct-08	May-09	Sep-09	Jul-10	Oct-10	Jul-11	Oct-11	Jun-12	Sep-12	May-16	Sep-16	Jul-17	Sep-17	Jun-18	Sep-18	Aug-19	Aug-20
GW Elev (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*437.47*
TCE	ND(0.01)	0.019	0.032	ND(0.05)	0.18	ND(0.5)	ND(0.05)	ND(0.03)	ND(0.05)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.3)	ND(0.3)	ND(0.3)	ND(0.3)

PCL (µg/L)	
TCE	5

Notes:

1. Results shown in **red** equal or exceed the PCL.
2. The PCL values presented in this figure are based on the remedial action objectives described in the OU6 ROD.
3. Analytical results shown 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 since 2007 are shown.
6. Data flags (qualifiers) are not shown due to space limitations.
7. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet). Vertical (where applicable) - North American Vertical Datum of 1988 (NAVD88) in feet.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough geographic information system (GIS) department: 2017 Fort Wainwright.SID

Legend:

- TCE Plume Monitoring Well Sampled in 2020
- Monitoring Well Sampled in 2020 (Non TCE Plume Well)
- Railroad
- Fence

Acronyms and Abbreviations

bgs - below ground surface
LOD - Limit of Detection
ND - Not Detected (LOD presented in parenthesis)
PCL - Project Cleanup Level
ROD - Record of Decision
TCE - Trichloroethene
µg/L - micrograms per liter

0 90 180
Feet

2020 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

TCE PLUME GROUNDWATER SAMPLE RESULTS

PROJECT No.: 551209

DATE: 3/5/2021

P.M./DRAWN: V.R. / C.B.

FIGURE: **3-4**

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2020 OU6 Report\F 3-4.mxd

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APPENDIX A
SAMPLE SUMMARY AND ANALYTICAL RESULTS

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TABLE A-1 GROUNDWATER SAMPLE SUMMARY
OU6, Former Communications Site - Fort Wainwright, Alaska

Sample ID	Location	Sample Type	Matrix	Sample Depth (feet btoc)	Sample Date & Time	Sampler	SDG	Lab	Cooler(s)	DRO (AK102)	RRO (AK103)	VOC (8260C)	VOC LL (8260C-SIM)	Dissolved Iron & Manganese (6020A)	Sulfate (300.0)
20FWOU601WG	MW13	N	WG	14.8	8/12/20 10:30 AM	CB	93062	APPL	081320				X	X	X
20FWOU602WG	MW08	N	WG	16.7	8/11/20 4:25 PM	PSRC	93062	APPL	081320				X	X	X
20FWOU603WG	MW47	N	WG	14.7	8/11/20 2:00 PM	PSRC	93062	APPL	081320				X	X	X
20FWOU604WG	MW79	N	WG	16.8	8/11/20 3:00 PM	PSRC	93062	APPL	081320				X	X	X
20FWOU605WG	MW61	N/MS/MSD	WG	13.5	8/11/20 1:30 PM	CB	93062	APPL	081320			X	X	X	X
20FWOU606WG	MW1010	FD of 20FWOU605WG	WG	13.5	8/11/20 1:45 PM	CB	93062	APPL	081320			X	X	X	X
20FWOU607WG	MW80	N	WG	41.8	8/11/20 2:50 PM	CB	93062	APPL	081320			X	X	X	X
20FWOU608WG	MW78	N	WG	32.0	8/11/20 12:30 PM	PSRC	93062	APPL	081320				X		
20FWOU609WG	MW91	N	WG	66.1	8/11/20 4:20 PM	CB	93062	APPL	081320				X		
20FWOU6EB01WG	RINSATE 1	EB	WQ	--	8/11/20 5:10 PM	CB	93062	APPL	081320			X	X	X	X
20FWOU6TB01WG	TRIP BLANK	TB	WQ	--	8/11/20 8:00 AM	--	93062	APPL	081320			X	X		
20FWOU610WG	MW03	N	WG	14.1	8/12/20 11:45 AM	CB	93049	APPL	Brice09, Brice12	X	X			X	X
20FWOU611WG	MW06A	N	WG	14.6	8/12/20 10:35 AM	KM	93049	APPL	Brice09, Brice12	X	X			X	X
20FWOU612WG	MW12R	N	WG	13.6	8/13/20 10:25 AM	KM	93049	APPL	Brice10, Brice12	X	X			X	X
20FWOU613WG	MW33	N/MS/MSD	WG	14.4	8/12/20 3:15 PM	CB	93049	APPL	Brice09, Brice12	X	X			X	X
20FWOU614WG	MW2020	FD of 20FWOU613WG	WG	14.4	8/12/20 3:30 PM	CB	93049	APPL	Brice10, Brice12	X	X			X	X
20FWOU615WG	MW37	N	WG	14.6	8/12/20 11:50 AM	KM	93049	APPL	Brice10, Brice12	X	X			X	X
20FWOU616WG	MW58	N	WG	12.3	8/12/20 3:15 PM	KM	93049	APPL	Brice10, Brice12	X	X			X	X
20FWOU617WG	MW62	N	WG	9.4	8/12/20 2:10 PM	CB	93049	APPL	Brice10, Brice12	X	X			X	X
20FWOU618WG	MW64	N	WG	13.3	8/13/20 11:40 AM	KM	93049	APPL	Brice11, Brice12	X	X			X	X
20FWOU619WG	MW77	N	WG	16.6	8/12/20 12:55 PM	KM	93049	APPL	Brice11, Brice12	X	X			X	X
20FWOU620WG	MW82	N	WG	16.1	8/12/20 2:00 PM	KM	93049	APPL	Brice11, Brice12	X	X			X	X
20FWOU6EB02WQ	RINSATE 2	EB	WQ	--	8/12/20 5:00 PM	CB	93049	APPL	Brice11, Brice12	X	X			X	X

Notes:

All sample results are reported under NPDL 20-092.

All sample results were requested on standard turnaround time.

APPL - APPL Laboratories
btoc - below top of casing
CB - Chris Boese
DRO - diesel range organics
EB - equipment blank
HCl - hydrochloric acid
HDPE - high density polyethylene
ID - identification
KM - Kyle Milke
L - liter
LL - low-level
mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
N - normal environmental sample
NPDL - North Pacific Division Laboratory
PSRC - Paturi Sai Ravi Chand
QC - quality control
RRO - residual range organics
TB - trip blank
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)
DRO/RRO - two HCl-preserved, 1 L amber bottles
VOC - three HCl-preserved, 40 mL VOA vials
VOC LL - three HCl-preserved, 40 mL VOA vials
Dissolved Metals - one HNO3-preserved, 125 mL HDPE bottle
Sulfate - one non-preserved, 125 mL HDPE bottle

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TABLE A-2 GROUNDWATER SAMPLE RESULTS
OU6, Former Communication Site - Fort Wainwright, Alaska

					Sample ID	20FWOU601WG	20FWOU602WG	20FWOU603WG	20FWOU604WG	20FWOU605WG	20FWOU606WG	20FWOU607WG	20FWOU608WG
					Location	MW13	MW08	MW47	MW79	MW61	MW1010	MW80	MW78
					Lab ID	BA16392	BA16393	BA16394	BA16395	BA16396	BA16397	BA16398	BA16399
					Collection Date	8/12/2020 10:30:00 AM	8/11/2020 4:25:00 PM	8/11/2020 2:00:00 PM	8/11/2020 3:00:00 PM	8/11/2020 1:30:00 PM	8/11/2020 1:45:00 PM	8/11/2020 2:50:00 PM	8/11/2020 12:30:00 PM
					Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					QC Type	Primary	Primary	Primary	Primary	MS/MSD	FD of 20FWOU605WG	Primary	Primary
Method	**Analyte[1]**	**ROD RG[1]**	**EPA MCL[2]**	**Units**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
AK102	**Diesel Range Organics**	1,500	NE	µg/L		--	--	--	--	--	--	--	--
AK103	**Residual Range Organics**	1,100	NE	µg/L		--	--	--	--	--	--	--	--
E300.0	Sulfate	NE	NE	µg/L		41300 [990]	42700 [198]	39900 [198]	57600 [990]	46900 [198]	42100 [198]	32100 [198]	--
SW6020A	Iron	NE	NE	µg/L		238 [30.00] J-,B	ND [30.00] J-	ND [30.00] J-	682 [30.00] J-,B	6210 [30.00]	6370 [30.00]	9300 [30.00]	--
SW6020A	Manganese	NE	NE	µg/L		110 [0.80] J-	8.1 [0.80] J-	4.2 [0.80] J-,B	446 [0.80] J-	1110 [0.80]	1120 [0.80]	754 [0.80]	--
SW8260C	1,1-Dichloroethene	NE	7	µg/L		--	--	--	--	ND [0.50]	ND [0.50]	ND [0.50]	--
SW8260C	1,2,3-Trichloropropane	0.12	NE	µg/L		--	--	--	--	ND [1.00]	ND [1.00]	ND [1.00]	--
SW8260C	cis-1,2-Dichloroethene	NE	70	µg/L		--	--	--	--	4.5 [0.30]	4.6 [0.30]	ND [0.30]	--
SW8260C	Tetrachloroethene	NE	5	µg/L		--	--	--	--	ND [0.30]	ND [0.30]	ND [0.30]	--
SW8260C	trans-1,2-Dichloroethene	NE	100	µg/L		--	--	--	--	4.8 [0.30]	5.0 [0.30]	ND [0.30]	--
SW8260C	**Trichloroethene**	5	5	µg/L		--	--	--	--	1.2 [0.30]	1.3 [0.30]	ND [0.30]	--
SW8260C	Vinyl chloride	NE	2	µg/L		--	--	--	--	ND [0.30]	ND [0.30]	ND [0.30]	--
SW8260C-SIM	**1,2,3-Trichloropropane**	0.12	NE	µg/L		ND [0.0050]	ND [0.0050]	**0.27 [0.0050]**	**4.8 [0.0500]**	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
SW8260C-SIM	Vinyl chloride	NE	2	µg/L		ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]

Notes:

[1] **OU6 ROD analytes are identified in blue text.** The ROD analytes are compared against the OU6 ROD RGs.

[2] The EPA MCLs are listed in the National Primary Drinking Water Regulations, EPA 816-F-09-004 (May 2009). Non-ROD analytes are compared against MCLs.

ROD RG exceedances are identified in RED text.

Gray shaded results are ND with LODs that exceed ROD RGs.

B - the result is biased high due to contamination present in a blank sample.

FD - field duplicate

EPA - Environmental Protection Agency

J/J-/J+ – the result is an estimated value based on an QAQC issue and/or is less than the LOQ. Where possible, direction of bias is indicated.

LOD - limit of detection

LOQ - limit of quantitation

MCL - maximum contaminant level

MS/MSD - matrix spike/matrix spike duplicate

µg/L - micrograms per liter

ND - not detected

NE - not established

OU6 - Operable Unit 6

QA - quality assurance

QC - quality control

RG - remedial goal

ROD - Record of Decision

TABLE A-2 GROUNDWATER SAMPLE RESULTS
OU6, Former Communication Site - Fort Wainwright, Alaska

					Sample ID	20FWOU609WG	20FWOU610WG	20FWOU611WG	20FWOU612WG	20FWOU613WG	20FWOU614WG	20FWOU615WG	20FWOU616WG
					Location	MW91	MW03	MW06A	MW12R	MW33	MW2020	MW37	MW58
					Lab ID	BA16400	BA16380	BA16381	BA16382	BA16383	BA16384	BA16385	BA16386
					Collection Date	8/11/2020 4:20:00 PM	8/12/2020 11:45:00 AM	8/12/2020 10:35:00 AM	8/13/2020 10:25:00 AM	8/12/2020 3:15:00 PM	8/12/2020 3:30:00 PM	8/12/2020 11:50:00 AM	8/12/2020 3:15:00 PM
					Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					QC Type	Primary	Primary	Primary	Primary	MS/MSD	FD of 20FWOU613WG	Primary	Primary
Method	Analyte[1]	ROD RG[1]	EPA MCL[2]	Units	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
AK102	Diesel Range Organics	1,500	NE	µg/L	--	ND [50]	4100 [250]	ND [50]	45000 [2500]	55000 [2500]	290 [50]	1400 [50]	
AK103	Residual Range Organics	1,100	NE	µg/L	--	ND [200]	ND [1000]	ND [200]	5700 [10000] J	6300 [10000] J	ND [200]	240 [200] J	
E300.0	Sulfate	NE	NE	µg/L	--	14400 [198]	4900 [198]	8500 [198]	2900 [198] J	5800 [198] J	32200 [198]	7500 [198]	
SW6020A	Iron	NE	NE	µg/L	--	13400 [30.00]	17700 [30.00]	9550 [30.00]	59800 [30.00]	58700 [30.00]	58.5 [30.00] B	5070 [30.00]	
SW6020A	Manganese	NE	NE	µg/L	--	763 [0.80]	1180 [0.80]	916 [0.80]	5690 [0.80]	5620 [0.80]	37.9 [0.80]	692 [0.80]	
SW8260C	1,1-Dichloroethene	NE	7	µg/L	--	--	--	--	--	--	--	--	
SW8260C	1,2,3-Trichloropropane	0.12	NE	µg/L	--	--	--	--	--	--	--	--	
SW8260C	cis-1,2-Dichloroethene	NE	70	µg/L	--	--	--	--	--	--	--	--	
SW8260C	Tetrachloroethene	NE	5	µg/L	--	--	--	--	--	--	--	--	
SW8260C	trans-1,2-Dichloroethene	NE	100	µg/L	--	--	--	--	--	--	--	--	
SW8260C	Trichloroethene	5	5	µg/L	--	--	--	--	--	--	--	--	
SW8260C	Vinyl chloride	NE	2	µg/L	--	--	--	--	--	--	--	--	
SW8260C-SIM	1,2,3-Trichloropropane	0.12	NE	µg/L	ND [0.0050]	--	--	--	--	--	--	--	
SW8260C-SIM	Vinyl chloride	NE	2	µg/L	ND [0.015]	--	--	--	--	--	--	--	

Notes:

[1] **OU6 ROD analytes are identified in blue text.** The ROD analytes are compared against the OU6 ROD RGs.

[2] The EPA MCLs are listed in the National Primary Drinking Water Regulations, EPA 816-F-09-004 (May 2009). Non-ROD analytes are compared against MCLs.

ROD RG exceedances are identified in RED text.

Gray shaded results are ND with LODs that exceed ROD RGs.

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FD - field duplicate

EPA - Environmental Protection Agency

J/J-/J+ – the result is an estimated value based on an QAQC issue and/or is less than the LOQ. Where possible, direction of bias is indicated.

LOD - limit of detection

LOQ - limit of quantitation

MCL - maximum contaminant level

MS/MSD - matrix spike/matrix spike duplicate

µg/L - micrograms per liter

ND - not detected

NE - not established

OU6 - Operable Unit 6

QA - quality assurance

QC - quality control

RG - remedial goal

ROD - Record of Decision

TABLE A-2 GROUNDWATER SAMPLE RESULTS
OU6, Former Communication Site - Fort Wainwright, Alaska

					Sample ID	20FWOU617WG	20FWOU618WG	20FWOU619WG	20FWOU620WG	20FWOU6EB01WG	20FWOU6EB02WQ	20FWOU6TB01WG
					Location	MW62	MW64	MW77	MW82	RINSATE 1	RINSATE 2	TRIP BLANK
					Lab ID	BA16387	BA16388	BA16389	BA16390	BA16401	BA16391	BA16402
					Collection Date	8/12/2020 2:10:00 PM	8/13/2020 11:40:00 AM	8/12/2020 12:55:00 PM	8/12/2020 2:00:00 PM	8/11/2020 5:10:00 PM	8/12/2020 5:00:00 PM	8/11/2020 8:00:00 AM
					Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Water QC	Water QC	Water QC
					QC Type	Primary	Primary	Primary	Primary	Equipment Blank	Equipment Blank	Trip Blank
Method	**Analyte[1]**	**ROD RG[1]**	**EPA MCL[2]**	**Units**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
AK102	Diesel Range Organics	1,500	NE	µg/L		250 [50]	290 [50]	5000 [500]	ND [50]	--	ND [50]	--
AK103	Residual Range Organics	1,100	NE	µg/L		ND [200]	ND [200]	ND [2000]	ND [200]	--	ND [200]	--
E300.0	Sulfate	NE	NE	µg/L		27800 [198]	11000 [198]	45900 [198]	11200 [198]	ND [198]	ND [198]	--
SW6020A	Iron	NE	NE	µg/L		25.8 [30.00] J,B	409 [30.00]	21.4 [30.00] J,B	60.7 [30.00] B	245 [30.00]	39.5 [30.00] J,B	--
SW6020A	Manganese	NE	NE	µg/L		832 [0.80]	112 [0.80]	617 [0.80]	25.0 [0.80]	2.5 [0.80] J,B	ND [0.80]	--
SW8260C	1,1-Dichloroethene	NE	7	µg/L		--	--	--	--	ND [0.50]	--	ND [0.50]
SW8260C	1,2,3-Trichloropropane	0.12	NE	µg/L		--	--	--	--	ND [1.00]	--	ND [1.00]
SW8260C	cis-1,2-Dichloroethene	NE	70	µg/L		--	--	--	--	ND [0.30]	--	ND [0.30]
SW8260C	Tetrachloroethene	NE	5	µg/L		--	--	--	--	ND [0.30]	--	ND [0.30]
SW8260C	trans-1,2-Dichloroethene	NE	100	µg/L		--	--	--	--	ND [0.30]	--	ND [0.30]
SW8260C	Trichloroethene	5	5	µg/L		--	--	--	--	ND [0.30]	--	ND [0.30]
SW8260C	Vinyl chloride	NE	2	µg/L		--	--	--	--	ND [0.30]	--	ND [0.30]
SW8260C-SIM	1,2,3-Trichloropropane	0.12	NE	µg/L		--	--	--	--	ND [0.0050]	--	ND [0.0050]
SW8260C-SIM	Vinyl chloride	NE	2	µg/L		--	--	--	--	ND [0.015]	--	ND [0.015]

Notes:

[1] **OU6 ROD analytes are identified in blue text.** The ROD analytes are compared against the OU6 ROD RGs.

[2] The EPA MCLs are listed in the National Primary Drinking Water Regulations, EPA 816-F-09-004 (May 2009). Non-ROD analytes are compared against MCLs.

ROD RG exceedances are identified in RED text.

Gray shaded results are ND with LODs that exceed ROD RGs.

B - the result is biased high due to contamination present in a blank sample.

FD - field duplicate

EPA - Environmental Protection Agency

J/J-/J+ – the result is an estimated value based on an QAQC issue and/or is less than the LOQ. Where possible, direction of bias is indicated.

LOD - limit of detection

LOQ - limit of quantitation

MCL - maximum contaminant level

MS/MSD - matrix spike/matrix spike duplicate

µg/L - micrograms per liter

ND - not detected

NE - not established

OU6 - Operable Unit 6

QA - quality assurance

QC - quality control

RG - remedial goal

ROD - Record of Decision

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APPENDIX B
CDQR AND ADEC LABORATORY DATA REIVEW CHECKLISTS

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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS B-3
1.0 INTRODUCTION B-5
2.0 DATA VERIFICATION, DATA QUALITY REVIEW, AND QUALIFICATION B-5
3.0 CHEMICAL DATA QUALITY REVIEW B-7

3.1 Analytical Samples and Field Quality Control B-8
3.2 Sample Collection B-8
3.3 Sample Handling and Chain-of-Custody B-9
3.4 Sample Preservation and Holding Time Compliance B-9
3.5 Sample Limits of Detection and Limits of Quantitation B-9
3.6 Blanks B-10
3.6.1 Method Blanks B-10
3.6.2 Trip Blanks B-10
3.6.3 Equipment Blanks B-10
3.7 Laboratory Control Samples B-11
3.8 Matrix Spike Samples and Duplicates B-11
3.9 Surrogates B-11
3.10 Field Duplicates B-11
3.11 Additional Quality Control Discrepancies B-12

4.0 COMPLETENESS B-12
5.0 OVERALL DATA QUALITY ASSESSMENT B-12
6.0 REFERENCES B-17

TABLES

Table B-1 Data Qualifiers B-7
Table B-2 Qualified Results Summary B-15

ATTACHMENTS

Attachment B-1 ADEC Laboratory Data Review Checklists

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
%	percent
%R	percent recovery
µg/L	micrograms per liter
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
APPL	APPL Labs
Brice	Brice Engineering, LLC
CCB	continuing calibration blank
CCV	continuing calibration verification
CDQR	Chemical Data Quality Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain-of-custody
DL	detection limit
DoD	U.S. Department of Defense
DQO	data quality objective
DRO	diesel range organics
EB	equipment blank
EPA	U.S. Environmental Protection Agency
FD	field duplicate
ID	identification
IS	internal standard
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
MB	method blank
MPC	measurement performance criteria
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
OU6	Operable Unit 6
PCL	project cleanup level
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RF	response factor

ACRONYMS AND ABBREVIATIONS (CONTINUED)

ROD	Record of Decision
RPD	relative percent difference
RRO	residual range organics
RSD	relative standard deviation
SDG	sample delivery group
SOP	standard operating procedure
TB	trip blank
TCE	trichloroethene
UCL	upper control limit
VOA	volatile organic analysis

1.0 INTRODUCTION

This Chemical Data Quality Report (CDQR) summarizes the quality assurance (QA)/quality control (QC) evaluation of laboratory data collected during groundwater sampling activities at the Operable Unit 6 (OU6) Former Communications Site, located at Fort Wainwright, Alaska, during August 2020. These data have been reviewed to evaluate compliance with QA/QC criteria based on data quality objectives (DQOs) specified in the approved *Final 2020 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan*, hereafter referred to as the Work Plan (Brice Engineering, LLC [Brice 2020a]), and *Final Postwide Uniform Federal Policy for Quality Assurance Project Plan (QAPP)*, hereafter referred to as the QAPP (Brice 2020b).

The associated Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklists are included as Attachment B-1. Complete analytical results in crosstab format and a sample summary are presented in Appendix A to the Monitoring Report.

2.0 DATA VERIFICATION, DATA QUALITY REVIEW, AND QUALIFICATION

APPL Labs (APPL) of Clovis, CA, was the primary laboratory for this project. APPL holds current ADEC laboratory approval and U.S. Department of Defense (DoD) Environmental Laboratory Accreditation Program certifications for all requested analyses, and chemical analyses for all parameters were performed in accordance with the DoD *Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3* (DoD 2019a). Samples were prepared and analyzed in accordance with analytical methods specified in *Test Methods for Evaluating Solid Waste SW-846* (U.S. Environmental Protection Agency [EPA] 2015); *Underground Storage Tanks Procedures Manual* (ADEC 2017); and laboratory standard operating procedures (SOPs).

The data quality review and assessment were performed by an experienced QA chemist independent of the analytical laboratory. This evaluation included completion of the ADEC Laboratory Data Review Checklists and review of analytical data including QC sample results, field and laboratory documentation, and all data submittals for each sample delivery group (SDG). Groundwater analytical results were compared to OU6 Record of Decision (ROD) project cleanup levels (PCLs) throughout this review and in the results table (Appendix A). ADEC 18 Alaska Administrative Code (AAC) 75 Table C values (ADEC 2018) are also shown in the results table for informational purposes.

All project data were reviewed on an analytical-batch basis by assessing QC samples and associated field sample results. Data quality review and usability assessment were performed using the QC criteria defined in DoD QSM 5.3 (DoD 2019a); *General Data Validation Guidelines* (DoD 2019b)*;* ADEC *Technical Memorandum Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data* (ADEC 2019a); specific method guidance, such as the ADEC *Underground Storage Tanks Procedures Manual* (ADEC 2017); *Test Methods for Evaluating Solid Waste SW-846* (EPA 2015); and the laboratory SOPs, in that order.

The following data quality indicators were used for this data quality review and assessment:

- *Precision* is a measure of the reproducibility of measurements and can be used to verify laboratory procedures, determine matrix effect, or sample homogeneity. Precision was measured by the relative percent difference (RPD) between laboratory control samples (LCSs)

and laboratory control sample duplicates (LCSDs), matrix spike (MS) and matrix spike duplicates (MSDs), or primary and field duplicate (FD) results.

- *Accuracy* is a measure of the correctness, or closeness to the true value. Accuracy was measured by the percent recovery (%R) of calibrations, surrogates, LCS, LCSD, MS, MSD, method blanks (MBs), relative response factors (RFs) and relative standard deviations (RSD), second column confirmations, and internal standards (ISs).
- *Representativeness* is a measure of the degree to which the samples reflect the site characteristics. Representativeness was measured by reviewing sampling design, sampling procedures, sample documentation, holding times, and preservations.
- *Completeness* is a measure of the amount of valid data obtained compared to the amount that was expected to be obtained under correct, normal conditions. For completeness requirements, valid results were all results not rejected and determined to be usable in the context of the DQOs. Completeness was evaluated for each analytical method for a particular sampling event with respect to each DQO or end data use. The completeness goal is 90 percent (%) for this project.
- *Comparability* is a measure of the confidence with which one data set can be compared to another. The following were reviewed to ensure comparability: use of standard methods for sampling and analysis, reporting in standard units, operating instruments within calibrated ranges, using standard and comprehensive reporting formats.
- *Sensitivity* is a measure the ability of a method or instrument to detect the target analyte at the level of interest. The laboratory-specific limits were evaluated against the project ROD PCLs to determine whether the analytical methods and/or laboratory procedures were able to meet the project DQOs.

The following information was reviewed as part of the data quality review and assessment:

- Sample handling and chain-of-custody (CoC)
- Sample preservation and holding time compliance
- Field QC samples including trip blanks (TBs) and FDs
- Laboratory reporting limits, including limits of detection (LOD) and limits of quantitation (LOQ)
- MBs
- LCS and LCSD recoveries
- Surrogate spike recoveries
- MS and MSD recoveries
- Initial and continuing calibration summary information
- IS performance (gas chromatography-mass spectrometry)
- Precision, including RPD values for duplicate analyses
- Case narrative review, laboratory flagging review, and other analytical method-specific criteria.

The data quality review and assessment identified results requiring qualification and potential effects on data usability based on the measurement performance criteria (MPC) outlined in the QAPP (Brice 2020b). The following qualifiers in Table B-1 were applied to the analytical data set, as appropriate.

Table B-1 Data Qualifiers

QUALIFIER	DESCRIPTION
ND [LOD]	The analyte was not detected and was reported as less than the LOD [LOD is presented in brackets].
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 low-bias due to a QC deviation.
J+	The analyte is considered an estimated value with a high-bias due to a QC deviation.
B	The analyte is detected in an associated blank. Result is less than 10x the concentration. Therefore, the result may be high-biased.
R	Analyte result is rejected – result is not usable. Note that "R" replaces the chemical result (no result shall be reported with an "R" flag).

Notes:
For definitions, see the Acronyms and Abbreviations section.

Qualification was not required in the following circumstances:

- Surrogate or MS recoveries outside QC limits, and dilution of the sample resulted in surrogate or spike dilution to a level beyond quantitation.
- MS recoveries were outside QC limits, and the spiked concentration was less than that of the parent sample.
- An analyte was detected in the associated blank, but there was no detection in the associated sample.
- MS/MSD or LCS/LCSD recoveries exceeded upper control limits (UCLs), and there was no detection in the sample(s).

Data were considered for rejection on the following grounds:

- Initial calibration (ICAL; per compound) criteria not met
- Continuing calibration (per compound) criteria not verified
- All non-detects with the continuing calibration recovery less than control limits
- All non-detects with the LCS recovery less than control limits
- Any compound with LCS recovery less than 10%
- Missed holding times greater than two times the method-specified holding time
- Surrogate recovery of less than 10% and a dilution factor of 5 or less

Data quality exceptions that do not result in qualifications are discussed in the associated ADEC Laboratory Data Review Checklists (Attachment B-1).

3.0 CHEMICAL DATA QUALITY REVIEW

The data verification and validation were performed to assess the overall quality and usability of the data collected to support sampling activities for the OU6 Former Communications Site.

Complete details for the review and evaluation of field samples and associated QC samples are included in this CDQR and in the ADEC Laboratory Data Review Checklists (Attachment B-1). During the data quality review, analytical results or recoveries that fell outside acceptance criteria were identified and qualifiers were applied to the results, where appropriate, in accordance with the project Work Plan (Brice 2020a).

Qualified results are considered estimated, and whenever possible, direction of potential bias was assigned and effects on usability are discussed.

The following sections describe the results of the review and assessment of data for each analytical method. QC parameters met DoD QSM v5.3 except where noted. A complete summary of qualified results is presented in Table B-2, located at the end of this report.

3.1 Analytical Samples and Field Quality Control

A total of eighteen primary groundwater samples, two FD groundwater samples, and two equipment blanks (EBs) were collected and analyzed in support of field and sampling activities at OU6, Former Communications Site. The sample summary table (Table A-1) in Appendix A includes all field samples submitted to the analytical laboratories.

The overall project-required frequency of one FD for every 10 or fewer primary samples, per analyte, per matrix, was met. MS/MSDs were collected and submitted to the laboratory at the project-required frequency of one set for every 20 or fewer project samples (5%) and one for every preparatory batch (designated MS/MSD samples were included with each shipment). An EB was collected and submitted to the laboratory at the project required frequency of 5%. TBs were included in each cooler containing samples for volatile analyses (SW8260C, SW8260C-SIM).

3.2 Sample Collection

All monitoring wells were purged and sampled with submersible pumps, and 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 Work Plan (Brice 2020a), that low-flow sampling criteria was employed (EPA 1996), and that all groundwater levels were within the screened intervals at the time of sampling, as appropriate.

All samples were collected as presented in the Work Plan, all monitoring wells met stabilization criteria prior to sample collection, and all water levels were within the screened interval at the time of sampling, with the exceptions noted below. Also summarized below are any notable observations discovered during sampling activities or during review of the groundwater sampling forms.

- Free product was not measured in any well during the 2020 sampling event. Both petroleum odor and sheen were observed on purge water from wells MW33 and MW77.
- All wells were found screened across the water table during purging and sampling activities, with four exceptions: MW78, MW91, MW80, and MW12R. Groundwater samples from these wells were collected from within the well screen in order to obtain a representative sample of the aquifer at depth.
    - Both sentry wells, MW78 and MW91, 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), which is also screened deep.
    - Monitoring well MW80, located within the trichloroethene (TCE) plume area, was initially screened below the water table to evaluate the vertical extent of contamination.
    - The well screen in monitoring well MW12R, located within the main DRO plume, was below the water table at the time of sampling due to elevated water levels in 2020. Impact

to the project is likely negligible as free project has not previously been measured in this well.

3.3 Sample Handling and Chain-of-Custody

CoC forms and laboratory case narratives were reviewed to assess sample handling procedures that may affect the integrity of the samples and quality of the resulting data. Copies of CoCs and cooler receipt forms were included in the final laboratory report. Groundwater samples were required to be maintained at 0 to 6 degrees Celsius (°C) following collection, during storage, and upon receipt at the laboratory.

Samples were packed with frozen gel packs in accordance with the Work Plan and the packaging and shipping SOP, *BE-SOP-03 Labeling, Packaging, and Shipping Samples* (Brice 2020b). Groundwater samples were shipped to Fresno, CA, via Alaska Airlines GoldStreak where they were picked up by APPL personnel and transported to the laboratory in Clovis, CA. Groundwater samples received at APPL were included in two SDGs: 93049 and 93062. All sample coolers were received with temperature blank and ambient cooler temperatures less than 6°C.

The following discrepancies were documented in the cooler receipt information:

- The sample receipt form for SDG 93049 noted that two one-liter diesel range organics (DRO)/ residual range organics (RRO) containers for EB sample 20FWOU6EB02WQ were received with cracked lids. The receiving staff noted that the sample containers had not leaked, so the lids were replaced, and the sample was analyzed according to the CoC. Project data were not impacted as the containers did not leak and the samples were not volatile samples.
- The sample receipt form for SDG 93062 noted that several volatile organic analysis (VOA) vials were received with bubbles. All bubbles were less than six millimeters, so data quality and usability were not affected.

All samples were submitted and analyzed for the correct analyses except for metals. The workplan specified method SW6010D for dissolved iron and manganese. The CoC for SDGs 93049 and 93062 both requested SW6010C but the laboratory analyzed all samples by SW6020A. This is a deviation from the workplan. The primary difference between these methods is that SW6010C/D utilizes atomic emission spectrometry to identify elements whereas SW6020A uses mass spectrometry. Both SW6010C/D and SW6020A are included on APPL's DoD cert and are acceptable methods for the analysis of metals in water; therefore, data quality/usability was not affected.

3.4 Sample Preservation and Holding Time Compliance

All samples were initially extracted and/or analyzed within the recommended holding times and were properly preserved for the analytical procedures used for this project.

3.5 Sample Limits of Detection and Limits of Quantitation

Sample LODs for non-detects and LOQs for detected results were compared to ROD PCLs to determine whether the laboratory data met MPCs for sensitivity. All ROD analytes had LODs for non-detect results and LOQs for detected results met the MPC for sensitivity, except the following:

- The non-detect LOD for AK103 analyte RRO exceeded the ROD PCL in project sample 20FWOU619WG due to sample dilution. The sample was diluted due to high DRO concentration.

Impact to the project is negligible as RRO is commonly non-detect in this well or is detected at concentrations an order of magnitude less than the ROD PCL.

- The non-detect LODs for SW8260C analyte 1,2,3-trichloropropane did not meet the ROD PCL due to limitations in the sensitivity of the method. However, this analyte was also reported by SW8260C-SIM which had LODs that met acceptance criteria, so data usability was not affected.

3.6 Blanks

MBs, TBs, and EBs were reviewed to detect potential cross-contamination. MB detections are indicative of laboratory cross-contamination, TBs measure shipment and storage cross-contamination, and EBs are reviewed to assess potential cross-contamination between wells where non-dedicated pumps are used.

3.6.1 Method Blanks

An MB was included with each analytical batch of 20 or fewer samples, as required. The following analytes were detected above the detection limit (DL) in an MB, and had associated project sample detections less than ten times the blank amount:

SW6020A analyte iron was detected in the MB for 93049 batch 256506. Associated sample results were qualified "B" for potential high bias:

- Dissolved Iron: 20FWOU615WG, 20FWOU617WG, 20FWOU619WG, 20FWOU620WG, and EB sample 20FWOU6EB02WQ.

SW6020A analyte manganese was detected in the MB for 93062 batch 256368. Associated sample results were qualified "B" for potential high bias:

- Dissolved Manganese: 20FWOU603WG and EB 20FWOU6EB01WG.

Neither iron nor manganese are site contaminants, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, the project was not impacted by potential slight laboratory cross-contamination.

MB detections with no related sample detections that required qualification are discussed in the ADEC Laboratory Data Review Checklists in Attachment B-1.

3.6.2 Trip Blanks

A TB was included in the cooler containing volatile samples, as required. No target analytes were detected above the DL in the TBs.

3.6.3 Equipment Blanks

An EB was collected at the required project frequency of 5%. The following analytes were detected above the DL in the EB and had associated project sample detections less than 10 times the blank amount:

SW6020A analyte iron was detected in the EB for SDG 93049 at a concentration greater than the LOD but less than the LOQ. This detection is attributed to laboratory cross-contamination as indicated by a similar detection in the associated MB, so no additional qualifiers were applied.

SW6020A analytes iron and manganese was detected in the EB for SDG 93062 at a concentration greater than the LOD but less than the LOQ. The manganese detection is attributed to laboratory cross-

contamination as indicated by a similar detection in the associated MB, so no additional qualifiers were applied. The associated sample results for iron were qualified "B" for potential high bias:

- Iron: 20FWOU601WG and 20FWOU604WG

Dissolved iron is not a site contaminant, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, the project was not impacted by potential slight cross-contamination.

EB detections with no related sample detections that required qualification are discussed in the ADEC Laboratory Data Review Checklists in Attachment B-1.

3.7 Laboratory Control Samples

An LCS or LCS/LCSD pair was included with each analytical batch, as required. LCS and LCSD %R and LCS/LCSD RPD were compared to the project MPC. All LCS and LCSD met acceptance criteria.

3.8 Matrix Spike Samples and Duplicates

An MS/MSD was included with each analytical batch, except as noted below:

- SW8260C-SIM batch 256335 (SDG 63062) did not include an MS/MSD. This batch only included a re-run for 1,2,3-trichloropropane in sample 20FWOU604WG. This batch did include an LCS/LCSD, which met precision criteria.

MS and MSD %R and MS/MSD RPD were compared to project MPCs. The following MS/MSD failures resulted in data qualification:

- Sulfate recovered above the UCL in the MS and MSD performed for project sample 20FWOU613WG in batch 255796. Additionally, the MS/MSD RPD exceeded the control limit. The reported sulfate result for 20FWOU613WG and FD 20FWOU614WG were qualified "J" for potential bias.

Sulfate is not a site contaminant, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, the impact to the project was negligible due to the MS/MSD recovery exceedances.

All other MS/MSD failures with no related sample detections that required qualification are discussed in the ADEC Laboratory Data Review Checklists in Attachment B-1.

3.9 Surrogates

Surrogates were included with all laboratory QC and field samples for organic analyses, as required. Surrogate %R were reviewed and compared to method control limits. All surrogate recoveries met acceptance criteria.

3.10 Field Duplicates

FD precision was evaluated by calculating the RPD between the parent sample result and the FD result when both results were above the LOQ. Acceptance criteria were less than 30% for water results.

Two FD samples (20FWOU614WG and 20FWOU606WG) were submitted and analyzed for eighteen primary groundwater samples.

The FD pair 20FWOU613WG/20FWOU614WG was analyzed for AK102, AK103, EPA 300.0, and SW6020A. All five pairs had both results greater than the LOQ, and RPD was calculated. The RPD for sulfate (66.7%) exceeded the recommended limit of 30% for waters. Both results were qualified "J" for potential indeterminate bias. This failure was likely due to sample heterogeneity and matrix effects, as sulfate failures were also noted in the MS/MSD performed for project sample 20FWOU613WG. All other RPDs met acceptance criteria.

The FD pair 20FWOU605WG/20FWOU606WG was analyzed for EPA 300.0, SW6020A, SW8260C, and SW8260C-SIM. Of twelve pairs of duplicate results, six pairs had both results as non-detect and RPD could not be calculated. The remaining six pairs had both results greater than the LOQ and RPD was calculated. The RPD for all pairs met acceptance criteria of 30% for waters.

3.11 Additional Quality Control Discrepancies

Additional discrepancies not noted in the previous sections of this report that resulted in data qualification are discussed here. Any discrepancies that did not require qualification are discussed in the ADEC Laboratory Data Review Checklists in Attachment B-1.

SW6020A IS recovered above the UCL in four project samples (20FWOU601WG, 20FWOU602WG, 20FWOU603WG, and 20FWOU604WG), the associated LCS/LCSD, continuing calibration verification (CCV), and continuing calibration blank (CCB). The affected project samples are listed below and were qualified "J-" for potential low bias. Impact to the project is negligible as these analytes are not site contaminants, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude.

- Dissolved iron and dissolved manganese: 20FWOU601WG, 20FWOU602WG, 20FWOU603WG, and 20FWOU604WG

4.0 COMPLETENESS

Completeness is a measure of the amount of valid data obtained compared with the amount that was expected to be obtained under correct, normal conditions. For completeness requirements, valid results are all results not rejected and determined to be usable in the context of project DQO.

Completeness was evaluated using the formula below. The goal for completeness was 90% for all methods and matrices.

$$\%\ Completeness\ =\ 100\ x\ (\frac{V}{n})$$

Where: V = number of measurements judged valid

n = total number of measurements

No results were rejected, and all results were considered usable. The completeness goal of 90% for all methods and matrices was met.

5.0 OVERALL DATA QUALITY ASSESSMENT

In general, the overall quality of the project data was acceptable, and completeness goals were met. Numerous QC issues required qualification of project data; however, there was little impact to the

usability of project data, and none of affected analytes were site contaminants. The following QC issues required qualification:

- MB and EB contamination
- MS/MSD percent recovery and RPD failures
- IS recovery failures
- FD imprecision

Qualified data are considered acceptable for use, with the limitations discussed within this QA/QC report and the ADEC Laboratory Data Review Checklists regarding the qualifiers applied to the results.

Table B-2 on the following page includes all qualified results and reasons for qualification.

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Table B-2 Qualified Results Summary

SDG	Location ID	Sample ID	Method	Analyte	Result	Units	Qual	Reason for Qualification
93049	MW33	20FWOU613WG	E300.0	Sulfate	2900 [198]	µg/L	J	MS/MSD %R and RPD. FD RPD
	MW2020	20FWOU614WG			5800 [198]	µg/L	J	
	MW37	20FWOU615WG	SW6020A	Iron	58.5 [30.00]	µg/L	B	MB
	MW62	20FWOU617WG			25.8 [30.00]	µg/L	J,B	
	MW77	20FWOU619WG			21.4 [30.00]	µg/L	J,B	
	MW82	20FWOU620WG			60.7 [30.00]	µg/L	B	
	RINSATE 2	20FWOU6EB02WQ			39.5 [30.00]	µg/L	J,B	
93062	MW13	20FWOU601WG	SW6020A	Iron	238 [30.00]	µg/L	J-,B	EB, IS > UCL
				Manganese	110 [0.80]	µg/L	J-	IS > UCL
	MW08	20FWOU602WG		Iron	ND [30.00]	µg/L	J-	
				Manganese	8.1 [0.80]	µg/L	J-	
	MW47	20FWOU603WG		Iron	ND [30.00]	µg/L	J-	
				Manganese	4.2 [0.80]	µg/L	J-,B	MB, IS > UCL
	MW79	20FWOU604WG		Iron	682 [30.00]	µg/L	J-,B	EB, IS > UCL
				Manganese	446 [0.80]	µg/L	J-	IS > UCL
	RINSATE 1	20FWOU6EB01WG		Manganese	2.5 [0.80]	µg/L	J,B	MB

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
LOD is shown in brackets [ ].
B – the result is potentially biased high due to contamination present in the MB or TB.
J – the result is an estimated value either because it is greater than or equal to the DL and below the LOQ, or as the result of a QC failure.

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6.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2017. *Underground Storage Tanks Procedures Manual, Guidance for Treatment of Petroleum-Contaminated Soil and Standard Sampling Procedures.* March.

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ADEC. 2019a. *Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data.* October.

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

Brice Engineering, LLC (Brice). 2020a. *Final 2020 CERCLA Site Work Plan Operable Units 1 through 6 – Fort Wainwright, Alaska.* July.

Brice. 2020b. *Final Postwide Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP) Various Sites – Fort Wainwright, Alaska.* June.

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EPA. 2015. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Third Edition, Final Updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), and V (2015).*

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ATTACHMENT B-1
ADEC LABORATORY DATA REVIEW CHECKLISTS

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Laboratory Data Review Checklist

Completed By:

Jillian Janssen

Title:

Chemist

Date:

November 9, 2020

Consultant Firm:

Brice Engineering

Laboratory Name:

APPL Labs

Laboratory Report Number:

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

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

   Yes☒ No☐ N/A☐ Comments:

   All analyses performed by APPL of Clovis, CA ADEC approval 17-05

   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☐ N/A☒ Comments:

2. Chain of Custody (CoC)

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

   Yes☒ No☐ N/A☐ Comments:

   b. Correct analyses requested?

   Yes☒ No☐ N/A☐ Comments:

3. Laboratory Sample Receipt Documentation

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

   Yes☒ No☐ N/A☐ Comments:

   Brice09- TB: 3.0° C, Cooler: 3.5° C;
   Brice10- TB: 2.0° C, Cooler: 0.8° C;
   Brice11- TB: 4.0° C, Cooler: 3.6° C;
   Brice12- Cooler: 3.8° C

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

   Yes☒ No☐ N/A☐ Comments:

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Yes☒ No☐ N/A☐ Comments:

Two 1-L DRO/RRO containers for equipment blank sample 20FWOU6EB02WQ were received with cracked lids. The receipt staff noted that the sample had not leaked, so the lids were replaced. Project data were not impacted as the containers did not leak and the sample was not a volatile sample.

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☐ N/A☐ Comments:

Only a cooler temperature was recorded for Brice12. Receipt staff initially could not find the temperature blank, which was found at a later date when the cooler was unpacked. Additionally, the lab reported temperatures for 5 coolers on their APPL Cooler receipt form because they mistakenly logged in samples from SDG 93062 with this SDG. Only 4 coolers were shipped with this SDG.

e. Data quality or usability affected?

Comments:

No impact to data quality or usability.

4. Case Narrative

a. Present and understandable?

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

- AK102: there were failures noted for the MS/MSD performed for sample 20FWOU613WG.
- 6020A: Iron was detected in the MB. Several MS/MSD failures were noted for the MS/MSD performed for 20FWOU613WG.
- Sulfate: MS/MSD failures were noted for the MS/MSD performed for 20FWOU613WG.

c. Were all corrective actions documented?

Yes☒ No☐ N/A☐ Comments:

6020A: samples affected by the MB detection were qualified “B”.

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Comments:

Effects are discussed in the applicable sections below.

5. Samples Results

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

Yes☐ No☒ N/A☐ Comments:

The workplan specified method SW6010D for dissolved iron and manganese at site OU6. The CoC requested SW6010C and the laboratory analyzed samples by SW6020A, which was a deviation from the work plan and the method requested on the CoC. The primary difference between the two methods is that SW6010C/D utilizes atomic emission spectrometry to identify elements whereas SW6020A uses mass spectrometry. Both SW6010C/D and SW6020A are included on APPL's DoD cert and are acceptable methods for the analysis of metals in water; therefore, data quality/usability was not affected.

b. All applicable holding times met?

Yes☒ No☐ N/A☐ Comments:

c. All soils reported on a dry weight basis?

Yes☐ No☐ N/A☒ Comments:

No soils included in this SDG.

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

Yes☐ No☒ N/A☐ Comments:

Sample LODs for non-detects were compared to the CULs (OU6 ROD Remedial Goals) to determine whether the laboratory data met measurement performance criteria for sensitivity. All reported LODs for non-detect results met project MPC for sensitivity, except as noted below:

- The non-detect LOD for AK103 analyte RRO exceeded the CUL in project sample 20FWOU619WG due to sample dilution. The sample was diluted due to a high DRO concentration. Impact to the project is negligible as RRO is commonly not detected in this well or is detected at concentrations an order of magnitude less than the ROD RG.

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

e. Data quality or usability affected?

The non-detect RRO result in sample 20FWOU619WG cannot be used to determine whether RRO is present above or below the CUL. See statement above regarding impact to the project.

6. QC Samples

a. Method Blank

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

Yes☒ No☐ N/A☐ Comments:

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes☐ No☒ N/A☐ Comments:

The following SW6020 analytes were detected in the MB for batch 256506 at a concentration greater than the DL but less than the LOQ: iron and manganese.

iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

- Iron was detected in project samples 20FWOU615WG, 20FWOU617WG, 20FWOU619WG, 20FWOU620WG, and equipment blank 20FWOU6EB02WQ at a concentration less than 10x the MB detection. All other results were greater than 10x the blank amount and were not affected.
- Manganese: all associated sample results are either non-detect or greater than 10x the amount detected in the MB.

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

Yes☒ No☐ N/A☐ Comments:

Iron project samples 20FWOU615WG, 20FWOU617WG, 20FWOU619WG, 20FWOU620WG, and equipment blank 20FWOU6EB02WQ were qualified “B” by the laboratory. This qualifier will remain.

v. Data quality or usability affected?

Comments:

Iron is not a site contaminant, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, the project was not impacted by potential slight laboratory cross-contamination.

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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☐ N/A☐ Comments:

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

Yes☐ No☒ N/A☐ Comments:

EPA 300.0 batch 255796 did not include a sample duplicate but is not required by the method. SW 6020 batch 256506 did not include a sample duplicate but did include an LCS and LCSD.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes☒ No☐ N/A☐ Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from LCS/LCSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes☒ No☐ N/A☐ Comments:

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

Comments:

N/A – all %R and RPD met acceptance criteria.

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

Yes☐ No☐ N/A☒ Comments:

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Comments:

N/A – all %R and RPD met acceptance criteria.

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes☒ No☐ N/A☐ Comments:

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes☒ No☐ N/A☐ Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable?

Yes☐ No☒ N/A☐ Comments:

- Sulfate recovered above the upper control limit (UCL) in the MS and MSD performed for project sample 20FWOU613WG in batch 255796.
- Iron and manganese recovered below the lower control limit (LCL) in the MS and MSD performed for project sample 20FWOU613WG in batch 256506.
- DRO recovered below the LCL in the MS and above the UCL in the MSD performed for project sample 20FWOU613WG in batch 256070.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from MS/MSD, and or sample/sample duplicate.

Yes☐ No☒ N/A☐ Comments:

Sulfate RPD exceeded the control limit in the MS/MSD performed for project sample 20FWOU613WG in batch 255796.

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

Comments:

Project sample 20FWOU613WG and field duplicate 20FWOU614WG are affected by the MS/MSD failures.

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Yes☒ No☐ N/A☐ Comments:

- Sulfate: the reported sulfate result in 20FWOU613WG and associated field duplicate 20FWOU614WG were qualified "J+" for the %R failure but were revised to the more conservative "J" for the RPD failure.
- Iron & Manganese: The reported iron and manganese results for 20FWOU613WG were greater than 4x the spike amount so the parent sample was not affected by the MS/MSD failure.
- DRO: the reported DRO result for 20FWOU613WG was greater than 4x the spike amount, so the parent sample was not affected by the MS/MSD failure.

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

Comments:

Sulfate is not a site contaminant, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, the impact to the project was negligible due to the MS/MSD recovery exceedances.

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

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

Yes☒ No☐ N/A☐ Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods 50-150 %R for field samples and 60-120 %R for QC samples; all other analyses see the laboratory report pages)

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☐ N/A☒ Comments:

iv. Data quality or usability affected?

Comments:

N/A – no failures identified.

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

e. Trip Blanks

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

Yes☐ No☐ N/A☒ Comments:

No volatile analyses included with this SDG.

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☐ N/A☒ Comments:

iii. All results less than LOQ and project specified objectives?

Yes☐ No☐ N/A☒ Comments:

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

v. Data quality or usability affected?

Comments:

N/A – no volatile analyses included with this SDG.

f. Field Duplicate

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

Yes☒ No☐ N/A☐ Comments:

One field duplicate was submitted and analyzed for ten primary groundwater samples.

ii. Submitted blind to lab?

Yes☒ No☐ N/A☐ Comments:

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

iii. Precision – All relative percent differences (RPD) less than specified project objectives? (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☒ N/A☐ Comments:

Field duplicate pair 20FWOU613WG/20FWOU614WG were submitted and analyzed for DRO, RRO, sulfate, dissolved iron, and dissolved manganese. All five pairs had both results greater than the LOQ and RPD was calculated. The RPD for sulfate (66.7%) exceeded the recommended limit of 30% for waters. Both results were qualified "J" for estimated, indeterminate bias. This failure is likely due to sample heterogeneity and/or matrix interference, as sulfate failures were also noted in the MS/MSD for sample 20FWOU613WG. All other RPD met acceptance criteria.

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

Comments:

Sulfate results were qualified "J" due to imprecision. Sulfate results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, impact to the project to due to this level of imprecision was negligible.

g. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below)?

Yes☒ No☐ N/A☐ Comments:

20FWOU6EB02WQ

i. All results less than LOQ and project specified objectives?

Yes☐ No☒ N/A☐ Comments:

Dissolved iron was detected in the equipment blank at a concentration greater than the LOD but less than the LOQ. This detection was attributed to laboratory cross contamination as indicated by a similar detection in the method blank, so additional qualifiers were not applied.

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

93049

Laboratory Report Date:

September 21, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

iii. Data quality or usability affected?

Comments:

Data quality and usability are not affected.

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

a. Defined and appropriate?

Yes☐ No☐ N/A☒ Comments:

Laboratory Data Review Checklist

Completed By:

Jillian Janssen

Title:

Chemist

Date:

December 8, 2020

Consultant Firm:

Brice Engineering

Laboratory Name:

APPL Labs

Laboratory Report Number:

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

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

   Yes☒ No☐ N/A☐ Comments:

   All analyses performed by APPL of Clovis, CA ADEC approval 17-05

   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☐ N/A☒ Comments:

2. Chain of Custody (CoC)

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

   Yes☒ No☐ N/A☐ Comments:

   b. Correct analyses requested?

   Yes☒ No☐ N/A☐ Comments:

3. Laboratory Sample Receipt Documentation

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

   Yes☒ No☐ N/A☐ Comments:

   081301- TB: 4.5° C, Cooler: 4.4° C

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

   Yes☒ No☐ N/A☐ Comments:

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Yes☒ No☐ N/A☐ Comments:

Sample receiving staff noted that several VOAs were received with small bubbles, but all were less than 6 mm.

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☐ N/A☐ Comments:

Receiving staff noted that plastic containers were not individually bagged.

e. Data quality or usability affected?

Comments:

No impact to data quality or usability.

4. Case Narrative

a. Present and understandable?

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

- 6020A: Internal standards in four project samples (20FWOU601WG, 20FWOU602WG, 20FWOU603WG, and 20FWOU604WG), the LCS/LCSD, CCV and CCB failed high. Additionally, iron and manganese failures were noted in the MS/MSD.

c. Were all corrective actions documented?

Yes☒ No☐ N/A☐ Comments:

The laboratory project manager notified the Brice PM about the QC failure.

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Comments:

Positive detections and non-detects for dissolved iron and dissolved manganese were qualified "J-" for potential low bias in project samples 20FWOU601WG, 20FWOU602WG, 20FWOU603WG, and 20FWOU604WG due to the internal standard failure.
Effects of the MS/MSD failures are discussed in the applicable sections below.

5. Samples Results

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

Yes☐ No☒ N/A☐ Comments:

The workplan specified method SW6010D for dissolved iron and manganese at site OU6. The CoC requested SW6010C and the laboratory analyzed samples by SW6020A, which was a deviation from the work plan and the method requested on the CoC. The primary difference between the two methods is that SW6010C/D utilizes atomic emission spectrometry to identify elements whereas SW6020A uses mass spectrometry. Both SW6010C/D and SW6020A are included on APPL's DoD cert and are acceptable methods for the analysis of metals in water; therefore, data quality/usability was not affected.

b. All applicable holding times met?

Yes☒ No☐ N/A☐ Comments:

c. All soils reported on a dry weight basis?

Yes☐ No☐ N/A☒ Comments:

No soils included in this SDG.

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

Yes☐ No☒ N/A☐ Comments:

Sample LODs for non-detects were compared to the CULs (OU6 ROD Remedial Goals) to determine whether the laboratory data met measurement performance criteria for sensitivity. All reported LODs for non-detect results met project MPC for sensitivity, except as noted below:

- The LOD for SW8260C analyte 1,2,3-trichloropropane did not meet the ROD RG due to limitations in the sensitivity of the method. This analyte was also reported by SW8260C-SIM and non-detect LODs met acceptance criteria using method SW8260C-SIM, so data quality and usability is not affected.

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

e. Data quality or usability affected?

Data quality and usability is not affected.

6. QC Samples

a. Method Blank

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

Yes☒ No☐ N/A☐ Comments:

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes☐ No☒ N/A☐ Comments:

The following SW6020A analyte was detected in the MB for batch 256368 at a concentration greater than the DL but less than the LOQ: manganese.

iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

Manganese was detected in project sample 20FWOU603WG and equipment blank 20FWOU6EB01WG at a concentration less than 10x the amount detected in the MB. All other associated sample results are either non-detect or greater than 10x the amount detected in the MB.

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

Yes☒ No☐ N/A☐ Comments:

Project sample 20FWOU603WG and equipment blank 20FWOU6EB01WG were qualified “B” by the laboratory. This qualifier will remain.

v. Data quality or usability affected?

Comments:

Manganese is not a site contaminant, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, the project was not impacted by potential slight laboratory cross-contamination.

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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☐ N/A☐ Comments:

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

Yes☐ No☒ N/A☐ Comments:

EPA 300.0 batch 255798 did not include a sample duplicate but is not required by the method. SW 6020 batch 256368 did not include a sample duplicate but did include an LCS and LCSD.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes☒ No☐ N/A☐ Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from LCS/LCSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes☒ No☐ N/A☐ Comments:

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

Comments:

N/A – all %R and RPD met acceptance criteria.

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

Yes☐ No☐ N/A☒ Comments:

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Comments:

N/A – all %R and RPD met acceptance criteria.

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes☐ No☒ N/A☐ Comments:

SW8260C-SIM batch 256335 did not include an MS/MSD. This batch only included a re-run for 1,2,3-trichloropropane in sample 20FWOU604WG. This batch did include an LCS/LCSD, which met precision criteria.

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes☒ No☐ N/A☐ Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable?

Yes☐ No☒ N/A☐ Comments:

- Iron and manganese recovered below the lower control limit (LCL) in the MS and MSD performed for project sample 20FWOU605WG in batch 256368.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from MS/MSD, and or sample/sample duplicate.

Yes☒ No☐ N/A☐ Comments:

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

Comments:

No samples were affected. The reported iron and manganese results for 20FWOU605WG were greater than 4x the spike amount so the parent sample was not affected by the MS/MSD failure.

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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

Yes☐ No☐ N/A☒ Comments:

Flags were not required, as discussed above.

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

Comments:

Data quality and usability were not affected.

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

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

Yes☒ No☐ N/A☐ Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods 50-150 %R for field samples and 60-120 %R for QC samples; all other analyses see the laboratory report pages)

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☐ N/A☒ Comments:

iv. Data quality or usability affected?

Comments:

N/A – no failures identified.

e. Trip Blanks

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

Yes☒ No☐ N/A☐ Comments:

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

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☐ N/A☐ Comments:

All samples and the TB were received in one cooler.

iii. All results less than LOQ and project specified objectives?

Yes☒ No☐ N/A☐ Comments:

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

v. Data quality or usability affected?

Comments:

No impact to data quality or usability.

f. Field Duplicate

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

Yes☒ No☐ N/A☐ Comments:

One field duplicate was submitted and analyzed for eight primary groundwater samples.

ii. Submitted blind to lab?

Yes☒ No☐ N/A☐ Comments:

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

iii. Precision – All relative percent differences (RPD) less than specified project objectives? (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☐ N/A☐ Comments:

Field duplicate pair 20FWOU605WG/20FWOU606WG were submitted and analyzed for sulfate, dissolved iron, and dissolved manganese, SW8260C and SW8260C SIM. Of twelve pairs of duplicate results, six pairs had both results as non-detect and RPD could not be calculated. The remaining six pairs had both results greater than the LOQ and RPD was calculated. The RPD for all pairs met acceptance criteria of 30% for waters.

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

Comments:

g. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below)?

Yes☒ No☐ N/A☐ Comments:

20FWOU6EB01WQ

i. All results less than LOQ and project specified objectives?

Yes☐ No☒ N/A☐ Comments:

Dissolved iron and dissolved manganese were detected in the equipment blank. The manganese detection was attributed to laboratory cross contamination as indicated by a similar detection in the method blank, so additional qualifiers were not applied.

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

Dissolved iron was detected in project samples 20FWOU601WG and 20FWOU604WG at a concentration less than 10x the EB amount and were qualified “B” for potential high bias.

93062

Laboratory Report Date:

September 16, 2020

CS Site Name:

OU6 - Former Communications Station – Fort Wainwright, AK

iii. Data quality or usability affected?

Comments:

Dissolved iron is not a site contaminant, and results are used to assess natural attenuation processes by evaluating changes in concentration by an order of magnitude. Therefore, the project was not impacted by potential slight cross-contamination.

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

a. Defined and appropriate?

Yes☐ No☐ N/A☒ Comments:

APPENDIX C
FIELD FORMS AND NOTES

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TABLE C-1 2018-2020 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)
MW03	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
	20FWOU610WG	8/12/2020	1145	13.11	Y	0.03	7.13	0.666	0.65	6.55	41.20	16.79	Y
MW06A	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
	20FWOU611WG	8/12/2020	1035	13.55	y	0.02	6.18	0.681	1.28	5.74	134.1	0.52	Y
MW08	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
	20FWOU602WG	8/11/2020	1625	15.70	Y	0.01	5.22	0.646	1.92	5.86	140.20	0.82	Y
MW12R	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
	20FWOU612WG	8/13/2020	1025	10.30	N	0.03	7.60	0.457	2.87	5.95	109.30	3.46	Y
MW13	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
	20FWOU601WG	8/12/2020	1030	13.83	Y	0.04	5.39	0.947	0.91	6.02	198.90	1.11	Y
MW33	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
	20FWOU613WG	8/12/2020	1515	13.36	Y	0.12	7.60	1.149	0.39	6.14	-29.70	1.13	Y
MW37	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
	20FWOU615WG	8/12/2020	1150	13.60	Y	0.05	13.49	0.672	6.33	6.57	140.80	0.16	Y
MW47	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
	20FWOU603WG	8/11/2020	1400	13.68	Y	0.00	7.62	0.842	6.88	6.38	114.80	2.46	Y
MW58	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
	20FWOU616WG	8/12/2020	1515	11.30	Y	0.03	7.82	0.699	1.04	6.13	140.70	9.78	Y
MW61	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
	20FWOU605WG	8/11/200	1330	12.46	Y	0.08	7.03	0.802	0.90	6.02	131.10	7.76	Y
MW62	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
	20FWOU617WG	8/12/2020	1410	11.69	Y	0.06	8.23	1.112	0.95	6.05	100.10	4.00	Y
MW64	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
	20FWOU618WG	8/13/2020	1140	12.30	Y	0.05	7.69	0.502	10.94	6.31	123.7	3.11	Y
MW77	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							
	20FWOU619WG	8/12/2020	1255	15.63	Y	0.07	6.83	0.887	2.74	6.10	155.70	2.39	Y
MW78	18FWOU616WG	6/22/2018	845	15.44	N[4]	0.00	6.05	0.456	0.94	7.25	-150.20	18.23	Y
	18FWOU633WG	9/20/2018	1330	14.43	N[4]	0.00	6.58	0.424	1.51	7.18	-127.60	8.03	Y
	19FWOU608WG	5/13/2019	1400	17.28	N[4]	0.00	6.15	0.527	0.37	7.26	-110.00	13.21	Y
	20FWOU608WG	8/11/2020	1230	14.27	N[4]	0.04	6.21	0.520	0.89	5.30	135.40	2.49	Y
MW79	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
	20FWOU604WG	8/11/2020	1500	15.77	Y	0.04	8.65	0.993	3.30	6.13	130.60	5.61	Y
MW80	18FWOU624WG	6/22/2018	1555	13.15	N[4]	0.00	5.51	0.378	0.40	8.32	-5.80	5.96	Y
	18FWOU641WG	9/21/2018	1330	12.33	N[4]	0.00	5.22	0.372	1.33	7.18	-119.10	6.18	Y
	19FWOU625WG	5/15/2019	1345	15.00	N[4]	0.00	6.56	0.405	0.24	7.33	-100.4	23.56	Y
	20FWOU607WG	8/11/2020	1450	11.96	N[4]	0.02	6.32	0.401	0.65	6.14	109.0	6.49	Y
MW82	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
	20FWOU620WG	8/12/2020	1400	15.10	Y	0.01	7.42	1.025	5.16	6.16	148.8	0.04	Y
MW91	18FWOU625WG	6/25/2018	915	15.78	N[4]	0.00	5.80	0.392	0.63	7.40	-159.20	0.61	Y
	18FWOU638WG	9/21/2018	1115	14.55	N[4]	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
	20FWOU609WG	8/11/2020	1620	14.37	N[4]	0.05	6.44	0.426	0.90	6.37	122.50	2.16	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).

[4] Wells were intentionally screened below to the water table to evaluate the potential for diving contaminant plumes.

Acronyms

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

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GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6
SAMPLE ID: 20FWOU6 01 WG
LOCATION ID: MW13
FD SAMPLE ID / LOC ID / TIME: —
LABORATORY ANALYSIS (circle): VOC, (VOC-Lt), DRO/RRO, (Dissolved Fe/Mn, Sulfate)
CHECKED SAMPLE pH: (Y) / N
APPROXIMATE VOLUME ADDED (mL): HCl = — HNO_3 = 0

DATE: 8/12/20
TIME: 1630
SAMPLER: CB
WEATHER/TEMP: CLOUDY / 55°F
MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other
SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 7 Turbidity Meter #: 11 Water Level: 10
WELL COMPLETION (circle): (Stick-up) / Flushmount
WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)
FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC): _____
TOTAL DEPTH (FT BTOC): 19.16
DEPTH TO WATER (FT BTOC): 13.83
WATER COLUMN HEIGHT (FT): = 5.33
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 0.87

ADDITIONAL NOTES:

SCREENED INTERVAL (FT BTOC): 9.2 - 19.2
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / Below Screen — Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 14.83

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.65	5.03	1.009	3.23	3.98	333.3	26.98	13.86
10	1.3	5.50	0.982	2.40	4.57	296.0	10.53	13.87
15	1.95	5.52	0.956	1.21	5.60	232.8	5.80	13.87
20	2.6	5.47	0.955	1.06	5.87	213.3	3.33	13.87
25	3.25	5.42	0.950	0.98	5.93	207.4	2.50	13.87
30	3.9	5.45	0.948	0.95	5.95	202.1	1.56	13.87
35	4.55	5.38	0.948	0.93	5.98	200.7	1.79	13.87
40	5.2	5.37	0.948	0.91	6.00	199.1	1.15	13.87
45	5.8	5.39	0.947	0.91	6.02	195.9	1.11	13.87
				CB				

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT? _____
DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT? _____
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) N IF NO, WHY NOT? _____
WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: _____
SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 6
CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N
DISPOSAL METHOD*: POL Water / (CERCLA Waste)
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice Engineering

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/11/20

SAMPLE ID: 20FWOU6 02 WG — TIME: 1625

LOCATION ID: MW08 — SAMPLER: PSRC

FD SAMPLE ID / LOC ID / TIME: — — WEATHER/TEMP: Cloudy, 64

LABORATORY ANALYSIS (circle): VOC, (VOC-LL) DRO/RRO, (Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / (N)

CHECKED SAMPLE pH: (Y) / N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 — HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 7 — Turbidity Meter #: 11 — Water Level: 13

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug (Y) / N Lock: Y / N Labeled: (Y) / N Well Damage: Y / (N)

ADDITIONAL NOTES: outer casing doesn't close completely

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

TOTAL DEPTH (FT BTOC): 22.15

DEPTH TO WATER (FT BTOC): 15.70

WATER COLUMN HEIGHT (FT): 6.45

SCREENED INTERVAL (FT BTOC): 12.1 - 22.1

WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / Below Screen (Above Screen)

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 16.70

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.05

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.7	6.46	0.647	2.27	5.64	145.8	1.43	15.71
10	1.4	5.51	0.646	2.07	5.85	137.6	0.88	15.71
15	2.1	5.14	0.646	1.96	5.86	138.1	1.05	15.71
20	2.8	5.22	0.646	1.92	5.86	140.2	0.82	15.71
				PSRC				

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 4.1 — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6

SAMPLE ID: 20FWOU6 03 WG

LOCATION ID: ~~MW-47~~ MW-47

FD SAMPLE ID / LOC ID / TIME: —

LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate

CHECKED SAMPLE pH: (Y) / N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/11/20

TIME: 1400

SAMPLER: PSRC

WEATHER/TEMP: CLOUDY, 57°

MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other

SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 7 Turbidity Meter #: 11 Water Level: 13

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug (Y) / N Lock: (Y) N Labeled: (Y) / N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC): _____

TOTAL DEPTH (FT BTOC): 19.8

DEPTH TO WATER (FT BTOC): - 13.68

WATER COLUMN HEIGHT (FT): = 6.12

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 0.997

ADDITIONAL NOTES:

SCREENED INTERVAL (FT BTOC): 9.8 – 19.8 Above screen

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~ PSRC

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 14.68

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.6	8.23	0.849	8.44	6.15	126.5	7.02	13.65
10	1.2	9.92	0.842	6.70	6.31	112.9	5.64	13.68
15	1.8	7.21	0.843	6.91	6.40	110.8	4.84	13.68
20	2.4	7.42	0.843	6.90	6.38	112.4	2.58	13.68
25	3	7.62	0.842	6.88	6.38	114.8	2.46	13.68
				PSRC				

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT? _____

DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT? _____

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT? _____

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: _____

SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 3.8

CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/11/20

SAMPLE ID: 20FWOU6 04 WG — TIME: 1500

LOCATION ID: MW79 — SAMPLER: PSRC

FD SAMPLE ID / LOC ID / TIME: — — WEATHER/TEMP: Cloudy, 61

LABORATORY ANALYSIS (circle): VOC (VOC-L), DRO/RRO, (Dissolved Fe/Mn, Sulfate) — MS/MSD PERFORMED? Y (N)

CHECKED SAMPLE pH: (Y)/ N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 — HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 7 — Turbidity Meter #: 11 — Water Level: 13

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug (Y)/ N — Lock: (Y)/ N — Labeled: (Y)/ N — Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

TOTAL DEPTH (FT BTOC): 21.55

DEPTH TO WATER (FT BTOC): 15.77

WATER COLUMN HEIGHT (FT): 5.78

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 0.942

ADDITIONAL NOTES: Stain on tubing

SCREENED INTERVAL (FT BTOC): 11.6 - 21.6 Above Screen

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Below Screen PSRC

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 16.77

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.64	7.66	1.102	4.82	5.85	142.4	26.96	15.84
10	1.28	8.05	1.038	3.67	5.96	133.6	10.20	15.81
15	1.92	8.33	1.008	3.35	6.10	130.2	6.50	15.81
20	2.56	8.80	0.999	3.32	6.13	130.8	5.53	15.81
25	3.2	8.65	0.993	3.30	6.13	130.6	5.61	15.81
			PSRC					

DID PARAMETERS STABILIZE? (Y)/ N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y)/ N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y)/ N — IF NO, WHY NOT? —

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 0.5 — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6
SAMPLE ID: 20FWOU6 05 WG
LOCATION ID: MW61
FD SAMPLE ID / LOC ID / TIME: 20FWOU606WG / AE-MW1010 / 1345
LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate
CHECKED SAMPLE pH: (Y) / N
APPROXIMATE VOLUME ADDED (mL): HCl = ✓ HNO_3 = 0

DATE: 8/11/20
TIME: 1330
SAMPLER: CB
WEATHER/TEMP: CLOUDY / 59 °F
MS/MSD PERFORMED? (Y) / N

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other
SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 16

WELL COMPLETION (circle): Stick-up / Flushmount
WELL CONDITION: Plug: (Y) N Lock: (Y) N Labeled: (Y) N Well Damage: Y / (N)
FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES: STRONG IRON IN WATER FOR FIRST

TOTAL DEPTH (FT BTOC): 20.16
DEPTH TO WATER (FT BTOC): 12.46
WATER COLUMN HEIGHT (FT): = 7.7
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 1.26

SCREENED INTERVAL (FT BTOC): 10.1 - 20.1 Above Screen
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / Below Screen CB
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 13.46

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.6	7.73	0.822	6.84	6.29	159.5	945.2	12.53
10	1.2	7.26	0.827	4.24	6.15	153.6	593.6	12.53
15	1.8	6.65	0.816	2.97	6.04	149.8	271.5	12.53
20	2.4	7.12	0.811	1.70	6.02	143.9	116.7	12.53
25	3	6.84	0.804	1.17	5.99	140.6	66.59	12.54
30	3.6	6.92	0.805	0.97	5.97	137.2	39.42	12.54
35	4.2	7.01	0.802	0.94	5.99	132.4	22.73	12.54
40	4.8	6.97	0.802	0.90	5.99	131.5	9.11	12.54
45	5.4	6.95	0.801	0.88	6.00	130.8	7.02	12.54
50	6	7.03	0.802	0.90	6.02	131.1	7.76	12.54

CB

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?
DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT?
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT?
WATER COLOR: (Clear) Yellow (Orange) Brown/Black (Sand/Silt) Other:
SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: ~~10~~ 25 g
DISPOSAL METHOD*: POL Water / (CERCLA Waste)
CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Bruce ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/11/20

SAMPLE ID: 20FWOU6 07 WG — TIME: 1450

LOCATION ID: MW80 — SAMPLER: CB

FD SAMPLE ID / LOC ID / TIME: — — WEATHER/TEMP: CLOUDY / 61°F

LABORATORY ANALYSIS (circle): VOC, NOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / N

CHECKED SAMPLE pH: Y / N — APPROXIMATE VOLUME ADDED (mL): HCl = — HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other — SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 — Turbidity Meter #: 14 — Water Level: 16

WELL COMPLETION (circle): Stick-up / Flushmount

WELL CONDITION: Plug: Y / N — Lock: Y / N — Labeled: Y / N — Well Damage: Y / N

FREE PRODUCT OBSERVED? Y / N — IF YES, DEPTH TO PRODUCT (FT BTOC): —

ADDITIONAL NOTES:

TOTAL DEPTH (FT BTOC): 46.80

DEPTH TO WATER (FT BTOC): - 11.96

WATER COLUMN HEIGHT (FT): = 34.84

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 5.68

SCREENED INTERVAL (FT BTOC): 36.8 - 46.8 (Above Screen)

WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 41.8

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.6	6.14	0.400	2.38	6.58	136.3	156.1	11.98
10	1.2	6.36	0.401	1.52	6.27	137.4	111.8	11.98
15	1.8	6.27	0.401	1.16	6.19	129.4	63.43	11.98
20	2.4	6.33	0.401	0.79	6.17	121.8	33.83	11.98
25	3	6.26	0.401	0.68	6.14	116.3	16.29	11.98
30	3.6	6.30	0.401	0.68	6.14	112.7	8.00	11.98
35	4.2	6.35	0.401	0.62	6.14	110.0	8.29	11.98
40	4.8	6.32	0.401	0.65	6.14	109.0	6.49	11.98

CB

DID PARAMETERS STABILIZE? Y / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? Y / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? Y / N — IF NO, WHY NOT? —

WATER COLOR: Clear — Yellow — Orange — Brown/Black (Sand/Silt) — Other: —

SHEEN: Y / N — ODOR: Y / N

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5 (5)

DISPOSAL METHOD*: POL Water / CERCLA Waste

CONTAINERIZED AND DISPOSED OF AS IDW? Y / N

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Bruce ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/11/20

SAMPLE ID: 20FWOU6 08 WG — TIME: 1230

LOCATION ID: MW-78 — SAMPLER: PSRC

FD SAMPLE ID / LOC ID / TIME: — — WEATHER/TEMP: CLOUDY, 57

LABORATORY ANALYSIS (circle): VOC, (VOC-LL), DRO/RRO, Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / (N)

CHECKED SAMPLE pH: Y / (N) — APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 7 — Turbidity Meter #: 11 — Water Level: 13

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N — Lock: (Y) / N — Labeled: (Y) / N — Well Damage: Y / (N)

ADDITIONAL NOTES:

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

TOTAL DEPTH (FT BTOC): 37.2 — SCREENED INTERVAL (FT BTOC): 27.2 - 37.2 (Above Screen)

DEPTH TO WATER (FT BTOC): 14.27 — WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / (Below Screen) PSRC

WATER COLUMN HEIGHT (FT): = 22.93 — DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 32

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 3.73

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.75	6.10	0.519	1.30	4.23	208.7	3.72	14.31
10	1.5	6.19	0.520	0.95	5.12	145.1	4.47	14.31
15	2.25	6.21	0.520	0.90	5.25	136.1	3.16	14.31
20	3	6.21	0.520	0.89	5.30	135.4	2.49	14.31
				PSRC				

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 4 — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/11/20

SAMPLE ID: 20FWOU6 09 WG — TIME: 1620

LOCATION ID: MW91 — SAMPLER: CB

FD SAMPLE ID / LOC ID / TIME: — — WEATHER/TEMP: CLOUDY / 63°F

LABORATORY ANALYSIS (circle): VOC, (VOC-LL) DRO/RRO, Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / (N)

CHECKED SAMPLE pH: ~~Y~~ N — APPROXIMATE VOLUME ADDED (mL): HCl = — HNO_3 = —

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 — Turbidity Meter #: 14 — Water Level: 16

WELL COMPLETION (circle): (Stick-up) / Flushmount — ADDITIONAL NOTES:

WELL CONDITION: Plug: (Y) N Lock: (Y) N Labeled: (Y) N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

TOTAL DEPTH (FT BTOC): 76.05 — SCREENED INTERVAL (FT BTOC): 56.1 – 76.1 (Above Screen)

DEPTH TO WATER (FT BTOC): 14.37 — WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ (CB)

WATER COLUMN HEIGHT (FT): = 61.68 — DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 66.05

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.168) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 10.1

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.65	7.55	0.425	2.92	6.53	145.4	47.49	14.42
10	1.3	6.04	0.426	1.86	6.42	143.3	9.91	14.42
15	1.95	6.64	0.426	1.36	6.40	136.0	5.99	14.42
20	2.6	6.52	0.425	1.01	6.38	127.6	4.08	14.42
25	3.25	6.48	0.426	0.96	6.37	124.6	1.79	14.42
30	3.9	6.45	0.426	0.92	6.37	122.9	2.00	14.42
35	4.5	6.44	0.426	0.90	6.37	122.5	2.16	14.42

CB

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5 — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Bryce ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/12/20

SAMPLE ID: 20FWOU6 10 WG — TIME: 1145

LOCATION ID: MW03 — SAMPLER: CB

FD SAMPLE ID / LOC ID / TIME: — — WEATHER/TEMP: CLOUDY 55°F

LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y (N)

CHECKED SAMPLE pH: (Y) / N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 — HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): ~~Submersible~~ / Peristaltic / Bladder / Other — SAMPLE METHOD: ~~Submersible~~ / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 7 — Turbidity Meter #: 11 — Water Level: 16

WELL COMPLETION (circle): Stick-up / Flushmount

WELL CONDITION: Plug (Y) / N — Lock: (Y) / N — Labeled (Y) / N — Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

ADDITIONAL NOTES:

TOTAL DEPTH (FT BTOC): 22.31 — SCREENED INTERVAL (FT BTOC): 12.3 - 22.3

DEPTH TO WATER (FT BTOC): - 13.11 — WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ Above Screen (CB)

WATER COLUMN HEIGHT (FT): = 9.20 — DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 14.11

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.5

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.7	7.58	0.671	1.63	6.38	91.8	904.8	13.14
10	1.4	7.60	0.667	1.05	6.48	72.1	219.9	13.14
15	2.1	7.05	0.666	0.83	6.47	62.7	83.13	13.14
20	2.8	7.10	0.665	0.79	6.57	47.6	41.30	13.14
25	3.5	7.11	0.666	0.69	6.55	45.0	14.21	13.14
30	4.2	7.15	0.665	0.64	6.55	44.8	14.17	13.14
35	4.9	7.13	0.666	0.65	6.55	41.2	16.79	13.14
			CB					

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES: Photo of set-up

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5 — CONTAINERIZED AND DISPOSED OF AS IDW? Y / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Bruce ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 08/12/20

SAMPLE ID: 20FWOU6 11 WG — TIME: 1035

LOCATION ID: MW-06A — SAMPLER: KM

FD SAMPLE ID / LOC ID / TIME: — WEATHER/TEMP: Rainy, 54°F

LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / (N)

CHECKED SAMPLE pH: (Y) / N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 — Turbidity Meter #: 14 — Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / N — IF YES, DEPTH TO PRODUCT (FT BTOC): —

ADDITIONAL NOTES: Oxidized Fe on outside of tubing.

TOTAL DEPTH (FT BTOC): 22.70 — SCREENED INTERVAL (FT BTOC): 12.4-22.4

DEPTH TO WATER (FT BTOC): 13.55 — WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Below Screen / (Above Screen)

WATER COLUMN HEIGHT (FT): 9.15 — DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 14.55

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.49

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	6.18	1.078	5.69	5.98	187.0	21.30	13.57
10	1.0	6.87	0.911	3.00	5.78	178.5	9.31	13.57
15	1.5	6.06	0.788	2.41	5.70	169.4	5.77	13.57
20	2.0	5.72	0.725	2.13	5.63	161.9	2.60	13.57
25	2.5	5.70	0.701	1.74	5.61	157.0	1.26	13.57
30	3.0	6.98	0.704	1.62	5.66	148.8	1.45	13.57
35	3.5	6.78	0.695	1.52	5.70	142.3	0.83	13.57
40	4.0	6.54	0.682	1.33	5.74	137.0	0.70	13.57
45	4.5	6.18	0.681	1.28	5.74	134.1	0.52	13.57

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: Clear (Yellow) Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.0 gal. — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/13/20

SAMPLE ID: 20FWOU6 12 WG — TIME: 1025

LOCATION ID: MW-12R — SAMPLER: KM

FD SAMPLE ID / LOC ID / TIME: — WEATHER/TEMP: Cloudy, 50°F

LABORATORY ANALYSIS (circle): VOC, VOC-LL, (DRO/RRO), Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / (N)

CHECKED SAMPLE pH: (Y) / N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 — Turbidity Meter #: 14 — Water Level: 15

WELL COMPLETION (circle): Stick-up / (Flushmount)

WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)

ADDITIONAL NOTES: Oxidized Fe on outside of tubing

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

TOTAL DEPTH (FT BTOC): 22.53

DEPTH TO WATER (FT BTOC): ~~10.3~~ 10.3

WATER COLUMN HEIGHT (FT): = 12.23

SCREENED INTERVAL (FT BTOC): 12.6 - 22.6

WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ (Above Screen)

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 13.6

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.99

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	7.57	0.455	4.11	5.47	176.6	24.91	10.33
10	1.0	6.38	0.459	2.63	5.43	162.6	16.45	10.33
15	1.5	6.95	0.459	2.05	5.52	149.0	10.68	10.33
20	2.0	6.98	0.458	2.10	5.64	138.0	9.47	10.33
25	2.5	7.15	0.457	2.23	5.74	129.5	8.82	10.33
30	3.0	7.14	0.457	2.79	5.80	124.0	8.50	10.33
35	3.5	7.06	0.457	3.21	5.85	119.3	7.27	10.33
40	4.0	7.41	0.457	2.98	5.89	115.0	5.78	10.33
45	4.5	7.60	0.457	2.87	5.95	109.3	3.46	10.33

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: Clear (Yellow) Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.0 gal. — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice Engineering

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6

SAMPLE ID: 20FWOU6 13 WG

LOCATION ID: MW33 MW2020

FD SAMPLE ID / LOC ID / TIME: 20FWOU6 14WG / ~~AP-3030~~ / 1530

LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate

CHECKED SAMPLE pH: (Y) N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/12/20

TIME: 1515

SAMPLER: CB

WEATHER/TEMP: CLOUDY 61°F

MS/MSD PERFORMED? (Y)/ N

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other

SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 7 Turbidity Meter #: 11 Water Level: 16

WELL COMPLETION (circle): Stick-up / Flushmount

WELL CONDITION: Plug: (Y) N Lock: (Y)/ N Labeled: (Y) N Well Damage: Y /(N)

FREE PRODUCT OBSERVED? Y /(N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES:

TOTAL DEPTH (FT BTOC): 20.86

DEPTH TO WATER (FT BTOC): - 13.36

WATER COLUMN HEIGHT (FT): = 7.5

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.22

SCREENED INTERVAL (FT BTOC): 11-21 Above Screen

WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ (CB)

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 14.36

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.65	7.58	1.192	1.42	5.66	85.2	15.00	13.47
10	1.3	7.86	1.189	0.93	5.64	63.8	10.10	13.48
15	1.95	7.65	1.184	0.63	5.95	30.8	7.86	13.48
20	2.6	7.51	1.173	0.53	6.05	12.7	3.81	13.48
25	3.25	7.51	1.162	0.44	6.10	-12.1	1.51	13.48
30	3.9	7.55	1.157	0.40	6.12	-19.9	0.98	13.48
35	4.55	7.57	1.152	0.41	6.13	-23.2	1.01	13.48
40	5.2	7.60	1.149	0.39	6.14	-29.7	1.13	13.48
			CB					

DID PARAMETERS STABILIZE? (Y)/ N IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y)/ N IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y)/ N IF NO, WHY NOT?

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:

SHEEN: (N)/ N ODOR: (Y) N STRONG POL

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 7

DISPOSAL METHOD*: POL Water / CERCLA Waste

CONTAINERIZED AND DISPOSED OF AS IDW? Y / N

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): ~~AOI~~ (FM) OU6
DATE: 08/12/20
SAMPLE ID: 20FWOU6 15 WG
TIME: 1150
LOCATION ID: MW-37
SAMPLER: KM
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP: Cloudy, 54°F
LABORATORY ANALYSIS (circle): VOC, VOC-LL, (DRO/RRO), (Dissolved Fe/Mn), (Sulfate)
MS/MSD PERFORMED? Y / (N)
CHECKED SAMPLE pH: (Y) N
APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other
SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15
WELL COMPLETION (circle): (Stick-up) / Flushmount
ADDITIONAL NOTES: ~~Dissolved Fe/Mn~~ Oxidized Fe + Mn on outside of tubing.
WELL CONDITION: Plug: (Y) / N Lock: (Y) N Labeled: (Y) / N Well Damage: Y / (N)
FREE PRODUCT OBSERVED? Y / N IF YES, DEPTH TO PRODUCT (FT BTOC):
TOTAL DEPTH (FT BTOC): 19.40
SCREENED INTERVAL (FT BTOC): 9.7 - 19.7 Above Screen
DEPTH TO WATER (FT BTOC): 13.60
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~
WATER COLUMN HEIGHT (FT): 5.8
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 14.60
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 0.95
* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	13.68	0.731	8.49	6.49	142.0	10.81	13.65
10	1.0	13.71	0.709	7.75	6.52	141.7	8.07	13.65
15	1.5	13.37	0.712	7.25	6.54	141.5	5.19	13.65
20	2.0	13.29	0.710	7.10	6.54	141.7	3.37	13.65
25	2.5	13.20	0.703	6.77	6.55	141.3	1.15	13.65
30	3.0	13.09	0.697	6.61	6.55	141.9	0.67	13.65
35	3.5	13.17	0.687	6.46	6.57	141.1	0.28	13.65
40	4.0	13.49	0.672	6.33	6.57	140.8	0.16	13.65

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?
DID DRAWDOWN STABILIZE? (Y) N IF NO, WHY NOT?
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) N IF NO, WHY NOT?
WATER COLOR: Clear (Yellow) Orange Brown/Black (Sand/Silt) Other:
SHEEN: Y / (N) ODOR: Y / (N)
ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.0 gal.
CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N
DISPOSAL METHOD*: POL Water / (CERCLA Waste)
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6

SAMPLE ID: 20FWOU6 16 WG

LOCATION ID: MW-58

FD SAMPLE ID / LOC ID / TIME:

LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate

CHECKED SAMPLE pH: Y / N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/12/20

TIME: 1515

SAMPLER: K M

WEATHER/TEMP: Partly Cloudy, 61°F

MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other

SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15

WELL COMPLETION (circle): Stick-up / (Flushmount)

WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled (Y) / N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES: Oxidized Fe on outside of tubing.

TOTAL DEPTH (FT BTOC): 18.25

DEPTH TO WATER (FT BTOC): 11.30

WATER COLUMN HEIGHT (FT): 6.95

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.13

SCREENED INTERVAL (FT BTOC): 8.2 - 18.2

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Above Screen) / Across Screen / ~~Below Screen~~

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 12.30

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	8.44	0.624	6.50	6.39	155.3	167.7	11.33
10	1.0	8.14	0.629	5.01	6.25	154.8	107.3	11.33
15	1.5	8.33	0.647	5.13	6.17	152.0	76.22	11.33
20	2.0	8.04	0.674	5.76	6.14	149.6	53.04	11.33
25	2.5	8.63	0.690	5.81	6.14	145.9	39.46	11.33
30	3.0	7.34	0.700	8.35	6.14	144.6	25.43	11.33
35	3.5	7.61	0.706	6.57	6.11	144.7	19.32	11.33
40	4.0	8.33	0.693	6.65	6.16	140.8	16.74	11.33
45	4.5	7.69	0.702	6.89	6.12	142.0	12.57	11.33
50	5.0	7.82	0.699	7.04	6.13	140.7	9.78	11.33

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT?

WATER COLOR: Clear Yellow (Orange) Brown/Black (Sand/Silt) Other:

SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.5gal.

CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice Engineering

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU 6
DATE: 8/12/20
SAMPLE ID: 20FWOU6 17 WG
TIME: 1410
LOCATION ID: MW62
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME: —
WEATHER/TEMP: CLOUDY 57°F
LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
CHECKED SAMPLE pH: (Y) / N
APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other
SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 7 Turbidity Meter #: 11 Water Level: 16
WELL COMPLETION (circle): Stick-up / Flushmount
ADDITIONAL NOTES:
WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)
FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC): —
TOTAL DEPTH (FT BTOC): 20.12
SCREENED INTERVAL (FT BTOC): 10-20' Above Screen
DEPTH TO WATER (FT BTOC): - 11.69
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / Below Screen (CB)
WATER COLUMN HEIGHT (FT): = 8.43
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC) * 9.43
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 1.37
* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.6	8.41	1.062	2.62	5.57	137.7	36.34	11.75
10	1.2	8.43	1.079	2.11	5.53	139.6	11.70	11.75
15	1.8	8.44	1.092	1.69	5.58	121.2	8.29	11.75
20	2.4	8.40	1.101	1.08	5.82	114.8	6.29	11.75
25	3	8.30	1.107	1.00	6.00	110.1	6.54	11.75
30	3.6	8.25	1.109	0.99	6.02	105.9	4.11	11.75
35	4.2	8.21	1.110	0.97	6.03	103.0	4.78	11.75
40	4.8	8.23	1.112	0.95	6.05	100.1	4.00	11.76

CB

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT? —
DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT? —
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT? —
WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: —
SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES: Photo at 1532

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5
CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N
DISPOSAL METHOD*: POL Water / (CERCLA Waste)
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/13/20

SAMPLE ID: 20FWOU6 18 WG — TIME: 1140

LOCATION ID: MW-64 — SAMPLER: KM

FD SAMPLE ID / LOC ID / TIME: — WEATHER/TEMP: Cloudy, 50°F

LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / (N)

CHECKED SAMPLE pH: (Y) / N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 — HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 — Turbidity Meter #: 14 — Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N — Lock: (Y) / N — Labeled: (Y) / N — Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

ADDITIONAL NOTES: Oxidized Fe on outside of tubing

TOTAL DEPTH (FT BTOC): 20.05

DEPTH TO WATER (FT BTOC): 12.30

WATER COLUMN HEIGHT (FT): = 7.75

SCREENED INTERVAL (FT BTOC): 10-20 Above Screen

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~ Flat

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 13.30

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.26

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	7.95	0.466	23.419	6.19	127.1	17.38	12.35
10	1.0	8.46	0.473	16.48	6.21	125.0	23.21	12.35
15	1.5	8.31	0.485	13.86	6.25	123.2	14.20	12.35
20	2.0	8.22	0.490	12.66	6.27	122.4	8.63	12.35
25	2.5	7.87	0.495	12.07	6.30	122.9	6.74	12.35
30	3.0	7.81	0.497	11.50	6.28	123.5	4.65	12.35
35	3.5	7.74	0.499	11.16	6.29	123.8	4.21	12.35
40	4.0	7.70	0.501	10.97	6.30	123.8	3.11	12.55
45	4.5	7.69	0.502	10.94	6.31	123.7	3.11	12.35

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: Clear, (Yellow) Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.0 gal. — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N

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

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6

SAMPLE ID: 20FWOU6 19 WG

LOCATION ID: MW-77

FD SAMPLE ID / LOC ID / TIME:

LABORATORY ANALYSIS (circle): VOC, VOC-LL, (DRO/RRO), Dissolved Fe/Mn, Sulfate

CHECKED SAMPLE pH: (Y)/N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/12/20

TIME: 1255

SAMPLER: ~~Cloudy~~ KM KM

WEATHER/TEMP: Cloudy, 55°F

MS/MSD PERFORMED? Y/(N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other

SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 141 Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug (Y)/N Lock: (Y)/N Labeled: (Y)/N Well Damage: Y/(N)

FREE PRODUCT OBSERVED? Y/(N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES:

TOTAL DEPTH (FT BTOC): 22.65

DEPTH TO WATER (FT BTOC): - 15.63

WATER COLUMN HEIGHT (FT): = 7.02

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2") (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.14

SCREENED INTERVAL (FT BTOC): 12.6 - 22.6

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~ (Above Screen)

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 16.63

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	8.39	0.954	4.39	6.26	157.4	9.12	15.70
10	1.0	7.69	0.957	3.45	6.17	156.5	8.44	15.70
15	1.5	6.62	0.923	3.27	6.12	157.4	5.44	15.70
20	2.0	6.56	0.900	2.94	6.11	156.7	3.03	15.70
25	2.5	6.58	0.892	2.87	6.11	155.7	2.38	15.70
30	3.0	6.83	0.887	2.74	6.10	155.7	2.39	15.70

DID PARAMETERS STABILIZE? (Y)/N IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y)/N IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y)/N IF NO, WHY NOT?

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:

SHEEN: Y/(N) ODOR: (Y)/N POL

ADDITIONAL NOTES: POL odor but no POL detected on water level. Very thin layer of sheen.

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 4.0 gal.

CONTAINERIZED AND DISPOSED OF AS IDW? (Y)/N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 6 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU6 — DATE: 8/12/20

SAMPLE ID: 20FWOU6 20 WG — TIME: 1400

LOCATION ID: MW-82 — SAMPLER: KM

FD SAMPLE ID / LOC ID / TIME: — WEATHER/TEMP: cloudy, 55°F

LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate — MS/MSD PERFORMED? Y / (N)

CHECKED SAMPLE pH: (Y) N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 — Turbidity Meter #: 14 — Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) N Lock: (Y) N Labeled: (Y) N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES:

TOTAL DEPTH (FT BTOC): 21.75

DEPTH TO WATER (FT BTOC): 15.10

WATER COLUMN HEIGHT (FT): = 6.65

SCREENED INTERVAL (FT BTOC): 11.7 - 21.7

WATER LEVEL WITH RESPECT TO SCREEN (circle): Above Screen / Across Screen / ~~Below Screen~~

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 16.10

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.08

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	9.01	1.037	7.58	6.32	153.6	5.13	15.11
10	1.0	7.44	1.038	5.87	6.18	153.6	3.20	15.11
15	1.5	7.77	1.037	5.79	6.16	151.9	2.35	15.11
20	2.0	7.74	1.029	5.85	6.16	150.0	1.00	15.11
25	2.5	7.93	1.026	5.10	6.18	148.3	0.48	15.11
30	3.0	7.78	1.028	5.21	6.18	148.1	0.26	15.11
35	3.5	7.42	1.025	5.16	6.16	148.8	0.04	15.11

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y) N — IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? Y / N — IF NO, WHY NOT?

WATER COLOR: Clear (Yellow) Orange Brown/Black (Sand/Silt) Other:

SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 4.5 gal. — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

Submersible Pump Equipment Blank

Rinsate #: 1

Sample ID: 20FW006EB01WQ

Date: 8/11/20

Time: 1710

Analysis: VOC, LL-VOC, Fe, SO4

Well that the pump was last used on: MW61

Submersible Pump Equipment Blank

Rinsate #: 2

Sample ID: 20FW006EB02WQ

Date: 8/12/20

Time: 1700

Analysis: DRO/RRO Fe/Mn SO4

Well that the pump was last used on: MW62

YSI Calibration Log

Project Name/Location: OU6 CERCLA Sites

ject Number: 551209

Equipment Make and Model(s): YSI & MPS556

Serial Number(s): 6, 7, 8 &

Serial Num.	Date	Temp.	pH (3 pt.)		Cond. (µs/cm)		ORP (mV)		DO (100%)		Initials
			Standard	Reading	Standard	Reading	Standard	Reading	Atm. Press. (mmHg)	Reading (%)	
7	8/11	19.43	4	4.10	1000	1027	240	248.8	749.8	8.69	PSRC
			7	6.77							
			10	10.46							
8	8/11	14.63	4	4.31	1000	1004	240	254.2	759.3	13.41	PSRC
			7	6.97							
			10	10.53							
6	8/12	20.74	4	4.04	1.000	0.940	240	220.3	749.6	8.27	KM
			7	6.87							
			10	10.08							
7	8/12	20.79	4	4.16	1.000	0.999	240	237.1	759.2	8.41	KM
			7	6.89							
			10	10.09							
6	8/13	19.96	10	9.93	1.000	0.992	240	246.6	760.8	16.11	KM
			7	7.11							
			4	3.91							

Turbidity Meter Calibration Verification Check

Project Name/Location: OU6 CERCLA Sites

Project Number: 551209

Equipment Make and Model(s): HF Scientific & MicroTPW Turbidimeter

Date	Time	Serial #: 11			Serial #: 14			Initials
		1000 NTU	10 NTU	0.02 NTU	1000 NTU	10 NTU	0.00 NTU	
8/11	1000	1009	10.19	0.22	1017	10.07	0.01	PSLC
8/12	0726	1009	10.16	0.03	1005	9.98	0.02	KM
8/13	0615				996.6	9.89	0.00	KM

OU6 FT. DA INWRIGHT

8/11/20
0900-1030 GWS PREP
~~1230~~ - (MOVE TO COMPLIANCE)

1230 - 1800 - GWS AT OU6

1330 - 1345 - MW61 + DUP + MS/MSD

1450 - MW80 - SEE FORM

1620 - MW91 - SEE FORM

1625 - LEAVE SITE

1640 - SHOP - COLLECT RINSATE / CLEAN UP
↳ 1710
1800 - EOD /Jr Burke

8/12/20
0800 - SHOP - GWS PREP

0930 - ON SITE

Scale: 1 square = _____

1030 - GWS MW13

1145 - GWS MW03

1410 - GWS MW62

1515/1530 - GWS MW33 + DUP + CLEAN UP.

1550 - LEAVE SITE

1610 - SHOP - CLEAN UP + RINSATE AT 1700
NOTE: POWER WENT OUT - WAIT FOR POWER TO COME BACK ON (SAMPLES IN FRIDGE).
1800 - EOD /Jr Burke

8/13/20 -
0800 - 1330 - PACK & SHIP 2 OU6 SHIPMENTS (MOVE TO IDW)
1530 - 1700 - CLEAN PUMPS - DECON WATER TRANSFER
/Jr Burke

Scale: 1 square = _____

08/12/20 Rainy, 54°F

PPE: Level D

Personnel: K. Milke - Sci.
C. Boese - Env. Tech.

Task: Sample 006 Wells.

0630 Calibrating instruments & getting gear together.

0927 Arrived @ MW-06A. Setting up equipment.

1046 Done @ MW-06A. Heading to MW-37.

1052 Arrived @ MW-37. Setting up equipment.

1157 Done sampling @ MW-37. Heading to MW-58.

1201 Arrived @ MW-58. Setting up equipment. No sockets to do flush mount. Heading to MW-77.

1211 Arrived @ MW-77. Setting up equipment.

2 8/12/20 Cont'd

~~1211 Ar~~ (Tim)

1307 Done sampling @ MW-77. Heading to MW-82.

1310 Arrived @ MW-82. Setting up equipment.

1409 Done sampling @ MW-82. Heading to MW-58.

1410 Arrived @ MW-58. Setting up equipment. Took 1 photo facing North.

1523 Done @ MW-58. Heading to Shop.

Tim

Scale: 1 square = _____

8/13/20 50°F, Cloudy 3

PPE: Level D

Personnel: K. Milke - Sci.

Task: Finish sampling OU6.

0923 Arrived @ MW-12R. Setting up equipment.

1039 Done @ MW-12R. Heading to MW-64.

1042 Arrived @ MW-64. Setting up equipment.

1143 Done @ MW-64. Heading to Shop.

Tim

Scale: 1 square = _____

Rite in the Rain

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APPENDIX D
PHOTOGRAPH LOG

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Collecting groundwater parameters at MW61 with Tanana Trails housing to the right and background (view E)

Collecting a groundwater sample at MW79 (view NA)

Groundwater sampling setup at MW91 with Quick Lane Tire & Auto Center in background (view NE)

Groundwater sampling at MW03 with playground in background (view E)

Groundwater sampling setup at MW62, located in the backyard of Tanana Trails housing unit #4713-2 (view S)

Groundwater sampling setup at MW58 with Building 4391 in background (view N)

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APPENDIX E
LTMO RESULTS

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Exhibit E-1 Mann-Kendall Trends of Main DRO Plume

MAROS Mann-Kendall Statistics Summary

Project: OU6 2020 **User Name:** BENG

Location: Fort Wainwright **State:** Alaska

Time Period: 10/17/2007 **to** 8/12/2020
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								
MW12R	S	18	17	0.86	-55	98.0%	No	D
MW58	T	18	18	0.40	5	55.9%	No	NT
MW33	T	18	18	0.74	71	99.7%	No	I
MW06A	T	19	19	0.54	-2	51.4%	No	S
PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP								
MW12R	S	18	11	1.19	-23	79.5%	No	NT
MW33	T	15	12	0.91	74	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.

MAROS Version 2,.2 2006, AFCEE Wednesday, December 16, 2020 Page 1 of 1

Exhibit E-2 Mann-Kendall Trends of Isolated DRO Plume

MAROS Mann-Kendall Statistics Summary

Project: OU6 2020 **User Name:** BENG

Location: Fort Wainwright **State:** Alaska

Time Period: 10/17/2007 **to** 8/12/2020
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	18	16	2.40	30	86.2%	No	NT
MW77	T	17	17	1.36	31	89.0%	No	NT
PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP								
MW62	S	18	11	2.31	18	73.8%	No	NT
MW77	T	17	10	1.32	-33	90.5%	No	PD

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-3 Groundwater Statistics Output DRO in MW12R

Groundwater Statistics Tool

Data input worksheet

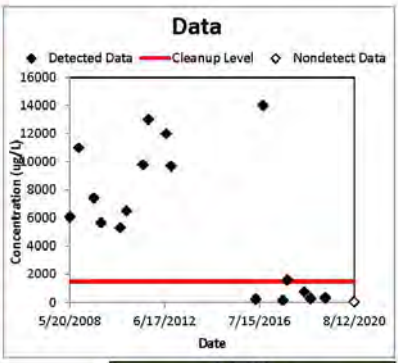
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/15/2020
Person performing analysis	AS

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:	18
Number of detected results:	17
Number of nondetect results:	1
Detection frequency:	0.944444444

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
8/12/2020	50	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-3 Groundwater Statistics Output DRO in MW12R (continued)

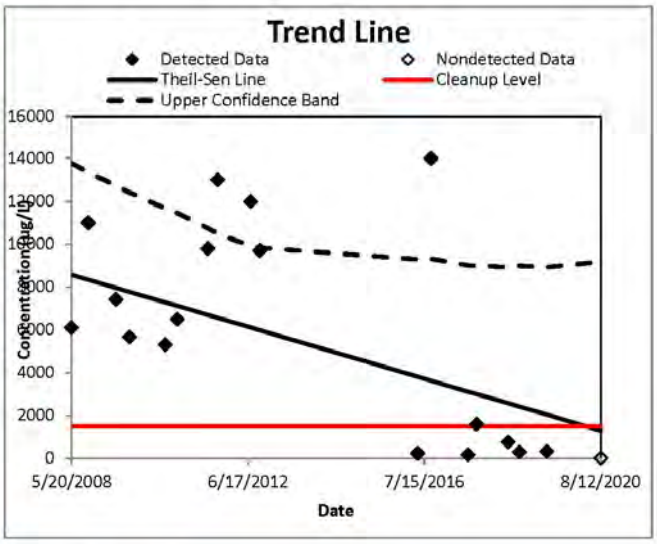
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/15/2020
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	18
Number of detected results	17
Number of non-detected results	1
Detection frequency	94%
Number at or below cleanup level	6
Are any potential outliers present?	No
Mean of concentration	5770
Standard deviation of concentration	4820



95% Upper Confidence Limit (UCL)	10900
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	9180
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.	

Exhibit E-4 Spatial Moment Analysis of Main DRO Plume

MAROS Spatial Moment Analysis Summary

Project: OU6 2020
Location: Fort Wainwright

User Name: BENG
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							
5/19/2016	2.4E+01	1,380,709	3,959,987	183	1,929	23,871	7
9/9/2016	5.3E+01	1,380,727	3,959,922	116	1,850	18,823	7
7/20/2017	1.7E+01	1,380,707	3,959,993	189	1,977	25,206	7
9/28/2017	2.3E+01	1,380,706	3,959,986	183	1,876	29,775	7
6/20/2018	2.3E+01	1,380,702	3,960,017	214	1,868	32,674	7
9/26/2018	2.2E+01	1,380,703	3,959,996	193	2,020	24,664	7
5/16/2019	3.9E+01	1,380,709	3,959,991	187	1,766	27,831	7
8/12/2020	2.9E+01	1,380,714	3,960,002	197	1,903	24,192	7

Exhibit E-4 Spatial Moment Analysis of Main DRO Plume (continued)

Project: OU6 2020
Location: Fort Wainwright

User Name: BENG
State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	PHC as DIESEL FUEL	0.41	2	54.8%	NT
1st Moment: Distance to Source					
	PHC as DIESEL FUEL	0.16	14	94.6%	PI
2nd Moment: Sigma XX					
	PHC as DIESEL FUEL	0.04	-2	54.8%	S
2nd Moment: Sigma YY					
	PHC as DIESEL FUEL	0.16	6	72.6%	NT

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-5 Sample Location Optimization Results for the Main DRO Plume

MAROS Sampling Location Optimization Results

Project: OU6 2020 **User Name:** BENG

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: From Sample Event 12 (5/19/2016) to Sample Event 19 (8/12/2020)

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	✔	0.247	0.212	0.287	
MW12R	1380767.88	3959725.50	✔	0.398	0.017	0.866	
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	✔	0.553	0.435	0.677	
MW35	1380346.38	3960282.00	✔	0.347	0.268	0.525	
MW37	1380539.63	3960388.00	✔	0.217	0.029	0.332	
MW58	1380547.88	3960074.25	✔	0.229	0.113	0.318	
MW64	1380852.63	3959938.75	✔	0.755	0.442	0.874	
MW82	1380712.63	3960750.75	✔	0.478	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.

MAROS Version 2.2, 2006, AFCEE Monday, December 14, 2020 Page 1 of 1

Exhibit E-6 Sampling Frequency Optimization of Main DRO Plume

MAROS Sampling Frequency Optimization Results

Project: OU6 2020 **User Name:** BENG

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 19

"Recent Period" defined by events: **From** Sample Event 12 (5/19/2016) **To** Sample Event 19 (8/12/2020)

"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	Annual	Annual	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	Annual	Annual	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.

MAROS Version 2.2, 2006, AFCEE Monday, December 14, 2020 Page 1 of 1

Exhibit E-7 Mann-Kendall Results for TCP Plume Wells

MAROS Mann-Kendall Statistics Summary

Project: OU6 2020 **User Name:** BENG

Location: Fort Wainwright **State:** Alaska

Time Period: 10/17/2007 **to** 8/12/2020
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	17	15	0.57	-50	97.9%	No	D
MW79	T	16	16	1.11	36	94.2%	No	PI

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 Monday, December 14, 2020 Page 1 of 1

Exhibit E-8 Groundwater Statistics Output TCP in MW47

Groundwater Statistics Tool

Data input worksheet

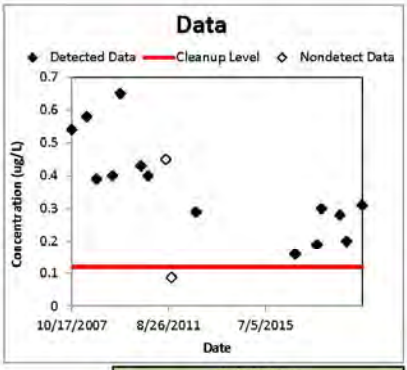
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Remediation
Date of Evaluation	12/15/2020
Person performing analysis	AS

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:	17
Number of detected results:	15
Number of nondetect results:	2
Detection frequency:	0.882352941

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
8/12/2020	0.27		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)

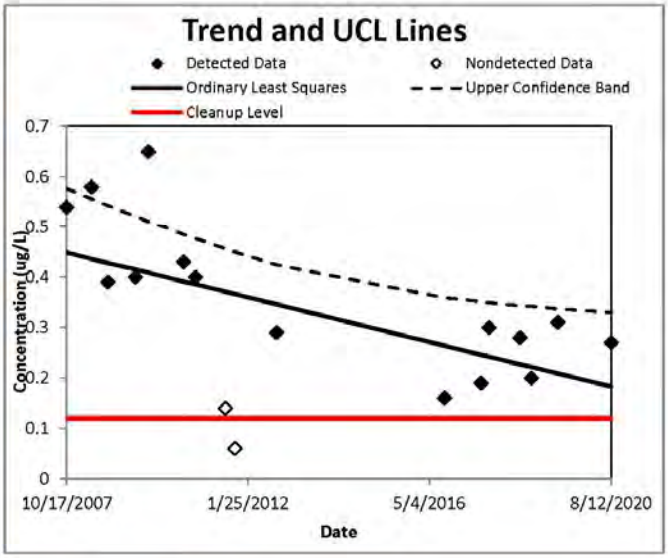
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Remediation
Date of Evaluation	12/15/2020
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	17
Number of detected results	15
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	0.339
Standard deviation of concentration	0.149



95% Upper Confidence Limit (UCL)	0.504
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.33
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.	

Exhibit E-9 Groundwater Statistics Output TCP in MW08

Groundwater Statistics Tool

Data input worksheet

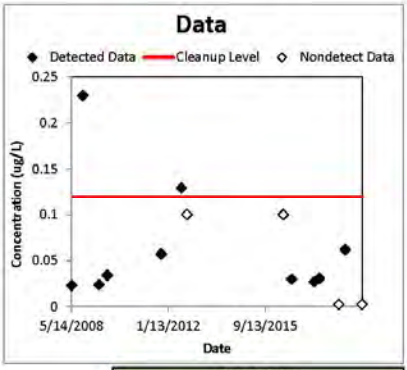
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/15/2020
Person performing analysis	AS

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:	15
Number of detected results:	10
Number of nondetect results:	5
Detection frequency:	0.666666667

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
8/12/2020	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)

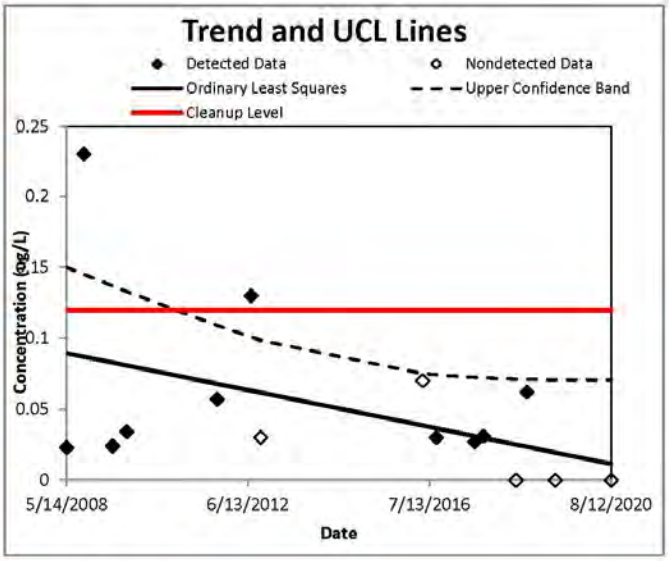
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/15/2020
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	15
Number of detected results	10
Number of non-detected results	5
Detection frequency	67%
Number at or below cleanup level	13
Are any potential outliers present?	Yes
Mean of concentration	0.0473
Standard deviation of concentration	0.058



95% Upper Confidence Limit (UCL)	0.116
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.0708
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.	

Exhibit E-10 Mann-Kendall Results for TCE Plume Well

MAROS Mann-Kendall Statistics Summary

Project: OU6 2020
User Name: BENG
Location: Fort Wainwright
State: Alaska

Time Period: 10/17/2007 **to** 8/12/2020
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	18	18	0.98	-120	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 Monday, December 14, 2020 Page 1 of 1

Exhibit E-11 Groundwater Statistics Output TCE in MW61

Groundwater Statistics Tool

Data input worksheet

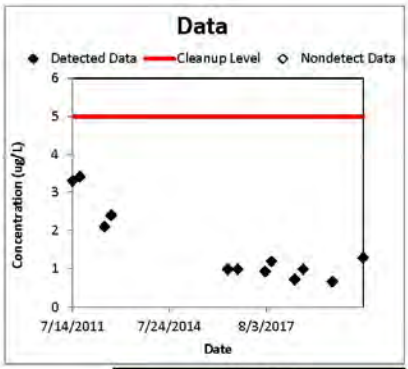
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/15/2020
Person performing analysis	AS

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:	12
Number of detected results:	12
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
8/12/20	1.3		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)

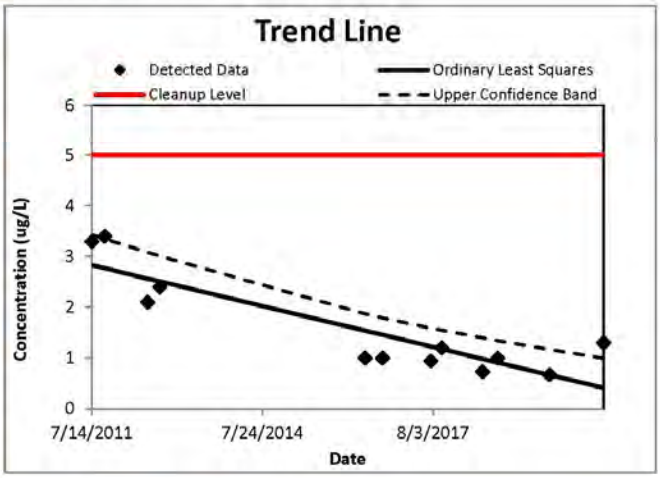
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/15/2020
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	12
Number < cleanup level	12
Are any potential outliers present?	No
Mean of concentration	1.59
Standard deviation of concentration	0.973



95% Upper Confidence Limit (UCL)	2.81
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.994
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.	

COMMENTS

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THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Environmental Conservation

SPILL PREVENTION & RESPONSE
Contaminated Sites Program

610 University Avenue
Fairbanks, Alaska 99709
Main: 907.451.2143
Fax: 907.451.2155
www.dec.alaska.gov

File: 108.38.085

April 19, 2021

Electronic Delivery Only
Department of the Army
Directorate of Public Works
ATTN: IMFW-PWE (B.Adams)
1046 Marks Road
Fort Wainwright, AK 99703

RE: ADEC comments for the *Draft 2020 Monitoring Report Former Communications Site, Operable Unit 6, Fort Wainwright, Alaska* (dated March 2021)

Dear Mr. Adams:

The Alaska Department of Environmental Conservation (ADEC) received the above-referenced document on March 8, 2021. The document presents results of the 2020 groundwater monitoring conducted at the Operable Unit 6 (OU6) Former Communications Site (FCS) on Fort Wainwright, Alaska (FWA). The OU6 FCS groundwater monitoring program focuses on five areas of contamination, three adjacent diesel range organics (DRO) plumes, one 1,2,3-trichloropropane (TCP) plume, and one trichloroethene (TCE) plume. In addition, groundwater samples are collected from background wells and sentry wells located near the water supply well. Analytical samples were collected from 18 wells during the August 2020 sampling event. An institutional controls (IC) inspection to evaluate the implementation and effectiveness of ICs was conducted during September 2020.

ADEC has provided review comments (see Enclosure). ADEC disagrees with the recommendation to decommission the four wells (MW28, MW32R, MW35 and MW48) that were approved for removal from the sampling program in the *Final 2019 Groundwater Monitoring Report Operable Unit 6* (April 2020). Those wells should be retained for now, and re-evaluated for decommissioning in a future year.

If there are any questions, please contact me by phone at (907) 451-2182, or by email at erica.blake@alaska.gov.

Sincerely,

Erica Blake

Digitally signed by Erica Blake
Date: 2021.04.19 11:22:58 -08'00'

Erica Blake
Environmental Program Specialist

Enclosure: ADEC Review Comments

cc (via email): Sandra Halstead, EPA
Christopher Zell, EPA
Seth Reedy, FWA ENVR
Tamara Scholten, FWA ENVR
Matthew Sprau, FWA ENVR Branch Chief
Bob Hazlett, USACE
Julie Allan, USACE
Amanda Sherman, USAEC

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Environmental Conservation

SPILL PREVENTION & RESPONSE
Contaminated Sites Program

610 University Avenue
Fairbanks, Alaska 99709
Main: 907.451.2143
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www.dec.alaska.gov

File: 108.38.085

May 25, 2021

Electronic Delivery Only
Department of the Army
Directorate of Public Works
ATTN: IMFW-PWE (B.Adams)
1046 Marks Road
Fort Wainwright, AK 99703

RE: ADEC responses to comments for the *Draft 2020 Monitoring Report Former Communications Site, Operable Unit 6, Fort Wainwright, Alaska* (dated March 2021)

Dear Mr. Adams:

The Alaska Department of Environmental Conservation (ADEC) provided review comments on April 19, 2021 for the above-referenced document. The document presents results of the 2020 groundwater monitoring conducted at the Operable Unit 6 (OU6) Former Communications Site (FCS) on Fort Wainwright, Alaska (FWA). The OU6 FCS groundwater monitoring program focuses on five areas of contamination, three adjacent diesel range organics (DRO) plumes, one 1,2,3-trichloropropane (TCP) plume, and one trichloroethene (TCE) plume. In addition, groundwater samples are collected from background wells and sentry wells located near the water supply well. Analytical samples were collected from 18 wells during the August 2020 sampling event. An institutional controls (IC) inspection to evaluate the implementation and effectiveness of ICs was conducted during September 2020.

ADEC reviewed the responses to comments and all comments have been accepted, pending a comment backcheck to the final document. If there are any questions, please contact me by phone at (907) 451-2182, or by email at erica.blake@alaska.gov.

Sincerely,

Erica Blake

Digitally signed by Erica Blake
Date: 2021.05.25 14:39:12 -08'00'

Erica Blake
Environmental Program Specialist

Enclosure: ADEC_Comments_OU6 2020 MR_RTCs

cc (via email): Sandra Halstead, EPA
Christopher Zell, EPA
Seth Reedy, FWA ENVR
Tamara Scholten, FWA ENVR
Matthew Sprau, FWA ENVR Branch Chief
Bob Hazlett, USACE
Julie Allan, USACE
Amanda Sherman, USAEC

REVIEW COMMENTS **PROJECT: Fort Wainwright, AK**
DOCUMENT: Draft 2020 Monitoring Report Former Communications Site, Operable Unit 6, Fort Wainwright, Alaska (dated March 2021)

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 04/19/2021 REVIEWER: Erica Blake PHONE: 907-451-2182	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	CONTRACTOR RESPONSE
1	Section 2.4 Institutional Control Inspections	There is discussion in the draft report on the 2020 IC inspection, however there are no corresponding inspection notes in the appendices. If there will be IC language included in this report, recommend noting where the inspection notes can be found (whether in this report or the 2020 Annual IC report). ADEC notes EPA made a similar comment.	A	In Section 2.4 (in the sentence preceding the inspection findings summary bullets), it is stated that the complete IC inspection results will be presented in the 2020 Fort Wainwright IC Inspection Report. For clarity, this statement will be moved to the beginning of Section 2.4. The first paragraph of Section 2.4 will be revised as follows: "IC inspections were conducted at OU6 during September 2020. A summary of the IC objectives and 2020 inspection findings are presented below. Complete inspection results are presented in the 2020 Fort Wainwright IC Inspection Report (Brice 2020c)."	Agree with comment backcheck.	
2	Section 3.2.2	In re-visiting the 2014 OU6 ROD, ADEC is curious why the two isolated DRO plumes are called out as "isolated" and with lower concentrations. What information is there that identifies these two isolated DRO plumes are not from the main source area? Couldn't the two isolated plumes be associated with the main plume? ADEC is asking this question for informational and clarifying purposes.	Noted	Remedial investigations (RIs) discovered multiple discontinuous source/release areas. It was determined that five groundwater plumes (main DRO plume, two isolated DRO plumes, TCP plume, and TCE plume) existed and this determination was accepted in the 2014 ROD, the 2015 RD/RA Plan, and the 2016 Fourth Five-Year Review by all parties, including ADEC. If ADEC has concerns about the five groundwater plume determinations, please address these concerns during the 2021 Five-Year Review.	Agree. ADEC will raise any concerns about the five groundwater plume determination in the forthcoming 2021 Five-Year Review.	

REVIEW COMMENTS **PROJECT: Fort Wainwright, AK**
DOCUMENT: Draft 2020 Monitoring Report Former Communications Site, Operable Unit 6, Fort Wainwright, Alaska (dated March 2021)

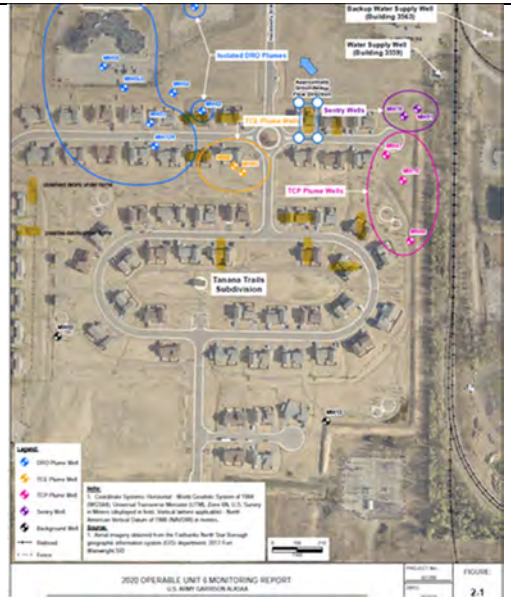
ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 04/19/2021 REVIEWER: Erica Blake PHONE: 907-451-2182	Action taken on comment by: Brice Engineering LLC

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	CONTRACTOR RESPONSE
3	Section 5.4 Recomenda tions	Statement: "The 2019 (and 2018) analytical results are provided in the Supplemental Information folder on the CD accompanyingthis report." ADEC has not received a CD accompanying this report, just the two 2020 laboratory reports. However, ADEC assumes the 2018 and 2019 analytical results are the same results provided for prior reports. Is this correct? Please confirm.	A	ADEC is correct the that the 2018 and 2019 analytical results are the same results provided in prior reports. However, this paragraph and associated Table 5-1 will be deleted from the report. Please also see the response to Comment #4.	Agree with comment backcheck.	
4	Section 5.4 Recomm endations tions and Table 5-1	ADEC disagrees with the recommendation for decommissioning the four wells, at this time. Currently these four wells act as boundary wells, and they have potential to become useful in the future, especially if the plume shape changes as a result of site condition changes. MW58, MW06A, MW33 and MW12R are in a line. If these wells are removed than there will be no wells to monitor and verify the plume is not migrating. ADEC recommends leaving the four wells in place and re-evaluating for decommissioning later.	A	The recommendation to decommission wells MW28, MW32R, MW35 and MW 48 will be removed from the report, as requested. This will result in the deletion of the second paragraph and associated Table 5-1.	Agree with comment backcheck.	
5	Section 6.0 References	The most current version of 18 AAC 75 is November 2020. Please make sure to reference and cite the most current version.	A	The 18 AAC 75 document will be updated, as suggested. In addition, a footnote to Table 1-2 will be added as follow: "PCLs are established in 18 AAC 75.345, Table C (ADEC 2020)."	Agree with comment backcheck.	

6	Figure 2-1	In looking at this figure, the groundwater gradient arrow points to the northwest. ADEC has reviewed site information on the four wells removed from the sampling program in 2019 and recommends adding three of those four wells back in at a reduced frequency (MW-35, MW-32R and MW-48) to continue to verify the plume will not or has not expanded in those directions.	Noted	The Army will continue to monitor groundwater contaminant plumes at this site. Adding wells MW-32R, MW-35, and MW-48 back into the sampling program, at a reduced frequency, may be considered in the future.	Agree.	
7	Appendix B CDQR and ADEC Laboratory Data Review Checklists, Section 3.2	Statement: "Impact to the project is likely negligible as free project…." Typo, free project should be 'free product.' Please correct.	A	The typo will be corrected, as suggested.	Agree with comment backcheck.	
8		--End of Comments--		Thank you!		

EPA Comments: Draft Operable Unit 6 Monitoring Report, March 2021

Number	Page	Section	Comment	
EPA received the Draft Operable Unit 6 2020 Monitoring Report, March 2021 for review on March 8, 2021. The report describes groundwater monitoring results and institutional control inspections at the Former Communications Site, now known as Tanana Trails housing. EPA did not develop comments on information related to the DRO plumes. Comments were submitted on April 8, 2021.				
1.	Table 1-1		EPA assigns an Operable Unit numeric value to a site within the Superfund Enterprise Management System (SEMS) when a site enters into CERLCA at the Remedial Investigation Workplan stage. Adding the EPA designation to Table 1-1 may be useful for tracking this site into the future. EPA has designated the Former Communications Site as OU 7. For EPA, OU 6 was designated as the Birch Hill Chemical Weapons Burial Site interim removal action workplan in 1995.	Accepted. The EPA designation will be added to Table 1-1 along with a footnote to clarify that EPA has designated the Former Communications Site as OU7.
2.	1.3.3 and Figure 2-1		Consider including a sentence that describes the debris remaining at the site. Fig A-22 of the ROD has housing units with debris observed under house foundations (Bldgs 15, 17, 22, 24, and 48) and buildings with possible debris under the foundation (Bldg 1, 11, 12, 13, 21, and 25).	Accepted. The ROD states that minor amounts of metal debris remain beneath several buildings, but that the presence of such materials is not a direct indication that chemical contamination is present. Only a few locations had limited volumes of contaminated soil associated with the subsurface debris. In addition, sub-slab soil gas sampling conducted at the residences did not provide evidence of significant soil contamination. Section 1.3.3

Number	Page	Section	Comment	
			I've marked up Figure 2-1 to show where the observed and possible debris under homes is located in relation to existing plumes. It seems pertinent to include this in the monitoring reports, especially if a significant seismic or other disturbance occurs at the site in the future.	will be revised to include this information regarding the remaining debris at OU6, and the impacted buildings will be identified on Figure 2-1.
3.	Figure 2-1 with observed and possible debris beneath foundations		 Vertical highlight is observed debris; horizontal highlight is possible debris.	Accepted. Figure 2-1 will be revised to identify the highlighted buildings. Also see response to Comment #2.
4.	Institutional Control inspection documentation		The IC inspection was summarized in this report but the corresponding documentation was not included. EPA	Accepted. In Section 2.4 (in the sentence preceding the inspection findings summary bullets), it is stated that the complete IC inspection results will be presented in the

Number	Page	Section	Comment	
			assumes the OU 6 Former Communications Site IC inspection documentation and detailed summary will be included in the Postwide 2020 Institutional Controls Report. If not, please add it as an appendix in this report.	2020 Fort Wainwright IC Inspection Report. For clarity, this statement will be moved to the beginning of Section 2.4. The first paragraph of Section 2.4 will be revised as follows: "IC inspections were conducted at OU6 during September 2020. A summary of the IC objectives and 2020 inspection findings are presented below. Complete inspection results are presented in the 2020 Fort Wainwright IC Inspection Report (Brice 2020c)."