Final

# 2021 Monitoring Report
# Former Communications Site, Operable Unit 6

U.S. Army Garrison Alaska

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

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

JULY 2022

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

July 1, 2022

Directorate of Public Works

Subject: Submission of the Final 2021 Operable Unit 6 Monitoring Report to the State of Alaska Department Environmental Conservation.

Mr. Timothy Sharp
Remedial Project Manager
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709

Dear Mr. Sharp:

This letter documents transmission of the Final 2021 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 Ms. Cascade Galasso-Irish, Alternate RPM, ADEC. 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 Ms. DePalma, RPM, at (907) 361-4512 or email keri.k.depalma.civ@army.mil; or Mr. Peter Baker, Alternate RPM, at (907) 361-6623 or email peter.a.baker8.civ@army.mil.

Sincerely,

DEPALMA.KERI.KOOPMAN.1005467434
Digitally signed by DEPALMA.KERI.KOOPMAN.1005467434
Date: 2022.07.01 10:23:33 -08'00'

Keri DePalma
Remedial Project 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**

July 1, 2022

Directorate of Public Works

Subject: Submission of the Final 2021 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 2021 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 Mr. Timothy Sharp, Remedial Project Manager (RPM) and Ms. Cascade Galasso-Irish, Alternate RPM, Alaska Department of Environmental Conservation (ADEC). If you would like to receive a hard copy of this document, please notify us within the next few weeks.

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Sincerely,

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Keri DePalma
Remedial Project Manager,
Directorate of Public Works

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HQ, USAG FWA CERCLA Information Repository (w/o encls)

Final

# 2021 Monitoring Report

# Former Communications Site, Operable Unit 6

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

JULY 2022

Prepared For:
U.S. Army Garrison Alaska

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAC | Alaska Administrative Code |
| ADEC | Alaska Department of Environmental Conservation |
| AFCEE | Air Force Center for Environmental Excellence |
| AOPI | area of potential interest |
| 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 |
| FCS | Former Communication Site |
| FFA | Federal Facility Agreement |
| ft | feet |
| GAC | granular activated carbon |
| GIS | geographic information system |
| HQAES | Headquarters Army Environmental System |
| IBC | intermediate bulk container |
| 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 |
| PA | preliminary assessment |
| PCB | polychlorinated biphenyls |
| PFAS | per- and polyfluoroalkyl substances |
| PSE | Preliminary Source Evaluation |
| POL | petroleum, oil, and lubricants |
| QC | quality control |
| QSM | Quality Systems Manual |
| RAO | Remedial Action Objective |
| RD/RA | Remedial Design/Remedial Action |
| RG | remedial goal |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| RPM | Remedial Project Manager |
| RRO | residual range organics |
| SI | site inspection |
| SGS | SGS North America, Inc. |
| 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 remedial goals (RGs), 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 2021. Samples were submitted for analyses that varied depending upon the plume that was being monitored. Sample results were compared to ROD RGs. Groundwater monitoring results between 2007 and 2021 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 RG in three wells associated with the main DRO plume. Wells in the isolated and adjacent DRO plumes did not exceed the DRO RG. RRO was below the RG in all wells except for one well in the main DRO plume. Overall, DRO and RRO concentrations were higher in 2021 than in 2020, which was likely attributed to the lower groundwater elevations observed in 2021. In areas where residual non-aqueous phase liquid (NAPL) exists, typically the 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 has historically had, and continues to have, the highest DRO and RRO concentrations at the site.

DRO and RRO concentrations in the interior of the main plume are expected to persist above the RG, 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 (met in 2020) 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 RG 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 RG in recent sampling events from 2018 through 2020. However, the DRO RG for this plume was not exceeded in the 2021 sampling event.

## 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. Two wells located within the TCP plume (source area well MW79 and downgradient well MW47) consistently have TCP concentrations exceeding the RG. The slightly upgradient well MW08 last had TCP concentrations exceeding the RG in 2012. Natural attenuation processes are expected to reduce concentrations in downgradient monitoring well MW47 to achieve cleanup attainment by 2038. Exceedances will likely continue in the two main TCP plume wells until the suspected TCP soil source is depleted.

Groundwater samples were collected from two downgradient sentry wells (MW78 and MW91) and one upgradient background well (MW13). 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 RG since at least 2011. In addition, statistical analysis continues to show a 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 RG has been achieved in accordance with U.S. Environmental Protection Agency (EPA) requirements (EPA 2014b).

TCE reductive dechlorination daughter products, cis-1,2-dichloroethene (DCE), trans-1,2-DCE, and vinyl chloride have been detected in one well (MW61) at concentrations less than the Federal Maximum Contaminant Levels (MCLs) by approximately an order of magnitude. Continued formation of daughter products shows that reductive dichlorination is occurring in the anaerobic aquifer.

## Institutional Control Inspection Summary

The annual IC inspection of OU6 was conducted during August 2021. 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. No deficiencies were identified during the 2021 IC inspections.

# 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 2021. This document also provides a summary of the institutional control (IC) inspections conducted at the OU6 site in 2021. 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 2020); the *2021 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan* (Brice 2021); under authority of CERCLA; and in compliance with the OU6 Record of Decision (ROD; U.S. Army Garrison Alaska [USAG Alaska] 2014), Federal Facility Agreement (FFA), and State of Alaska regulations.

The primary objectives for the 2021 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 Alaska 2014), previously detected contaminants (USACE 2012b), and geochemical parameters.
- Compare results with ROD-established remedial goals (RGs) (USAG Alaska 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 2021.

## 1.1 Project Overview and Monitoring Report Organization

The 2021 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<br>05309914703<br>06309911001<br>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 and contaminant trends began at OU6 in 2005 and continued through the Remedial Investigation (RI; USACE 2010). Based on this data, MNA was the chosen

remedy for the site. The effectiveness of the ROD-selected remedy continues to be assessed through ongoing groundwater monitoring. 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.
- In 2020, a post-wide preliminary assessment (PA) and site inspection (SI) for per- and polyfluoroalkyl substances (PFAS) was conducted, which included the OU6 source areas (USACE 2022).

### 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 RGs for groundwater were identified in the OU6 ROD (USAG Alaska 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 RGs.
- Return groundwater to its beneficial use as a drinking water source. VOCs are expected to reach RGs 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 RGs.

### 1.4.2 Project Remedial Goals

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

**Table 1-2 OU6 Remedial Goals for Groundwater**

| COCs | ROD RGs[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] RGs are established in 18 AAC 75.345, Table C (ADEC 2021).

# 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 4-6 August 2021. Groundwater monitoring was conducted in accordance with the procedures detailed in the 2021 CERCLA Sites Work Plan (Brice 2021) and Postwide UFP-QAPP (Brice 2020). The general contaminant plume areas and associated monitoring wells sampled during the 2021 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 three exceptions: MW78, MW80, and MW91. 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. 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 within the top foot 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 SGS North America, Inc. (SGS) of Anchorage, Alaska, for analysis on 9 August 2021. 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 shown in Figure 2-1 that was vegetated and at least 100 feet from any surface water body source, as specified in the 2021 CERCLA Sites Work Plan (Brice 2021).

## 2.3 Investigation-Derived Waste Handling and Disposal

IDW generated during OU6 field activities in 2021 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 2021 CERCLA Sites Work Plan (Brice 2021).

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 Hazardous Waste Consolidation Facility (Building 3489) for temporary storage since the Defense Environmental Restoration Account (DERA) building was closed for building upgrades. Since the OU6 purge water may potentially be contaminated from PFAS, the water was then pumped from the 15-gallon poly drums and treated with granular activated carbon (GAC), per the Work Plan. Following treatment, the water was consolidated into a 275-gallon intermediate bulk container (IBC).

The water was characterized using the laboratory results from the individual wells. Sample results and the IDW storage forms were provided to 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 2021 IDW Management Technical Memorandum (anticipated Spring 2022).

## 2.4 Institutional Control Inspections

IC inspections were conducted at OU6 during August 2021. A summary of the IC objectives and 2021 inspection findings are presented below. Complete inspection results are presented in the 2021 Fort Wainwright IC Inspection Report (anticipated Spring 2022).

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 2021 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 RGs 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 RGs are met.
- Prevent unauthorized access to soil greater than 6 inches bgs until RGs 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 Remedial Project Mangers (RPMs), IC inspection of residences were reduced from 100% to 20% beginning in 2019. In 2021, 11 residential units (22 individual yards) were inspected in accordance with the 2021 CERCLA Sites Work Plan (Brice 2021). In addition, the two residences where IC deficiencies were noted during the 2020 IC inspection were included in the 2021 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 2021 IC inspection findings is presented below, and the complete inspection results are presented in the 2021 Fort Wainwright IC Inspection Report (anticipated Spring 2022).

- Soil disturbances greater than 6 inches bgs were not observed. The two IC deficiencies (observations of soil disturbances caused by dogs) noted during the 2020 IC inspections were not observed during the 2021 IC inspections.
- 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 except for minor damage to an overcasing lid on well MW90. The overcasing lid was replaced and the well was properly secured.

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 2021 groundwater monitoring results for OU6. Groundwater monitoring was completed in accordance with the 2021 CERCLA Sites Work Plan (Brice 2021) and Postwide UFP-QAPP (Brice 2020). 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 RGs are shown on Figures 3-2, 3-3, and 3-4, respectively. Complete 2021 analytical results are presented in Appendix A.

## 3.1 Groundwater Elevations

Groundwater levels were measured for the purposes of mapping groundwater elevation contours on 13 July 2021. 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. The groundwater levels measured in 2019, 2020, and 2021 for depicting contours are also shown in Table 3-1 (located at the end of Section 3) for comparison.

Groundwater levels were measured again in each well during the sampling event on 4-6 August 2021. Groundwater elevations measured in August 2021 were approximately 2.2 feet lower than the August 2020 elevations, and similar in elevation to those measured in May 2019. In general, higher contaminant concentrations were observed in 2021 and 2019 in areas with residual non-aqueous phase liquid (NAPL) due to the lower groundwater elevations, as further discussed in the following sample results sections.

## 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) for comparison. DRO and RRO results between 2007 and 2021 are presented on Figure 3-2; and DRO, RRO, and MNA parameters for 2018 through 2021 sampling events are presented in Table 3-2 (located at the end of Section 3).

In general, DRO concentrations in 2021 were higher than the concentrations observed in 2020. This may have been a result of the lower groundwater elevations (approximately 2.2 feet) at the time of the 2021 sampling event. Typically, in areas where residual NAPL exists, highest contaminant concentrations are measured when groundwater elevations are lowest as NAPL is allowed to drain from soil onto the groundwater surface.

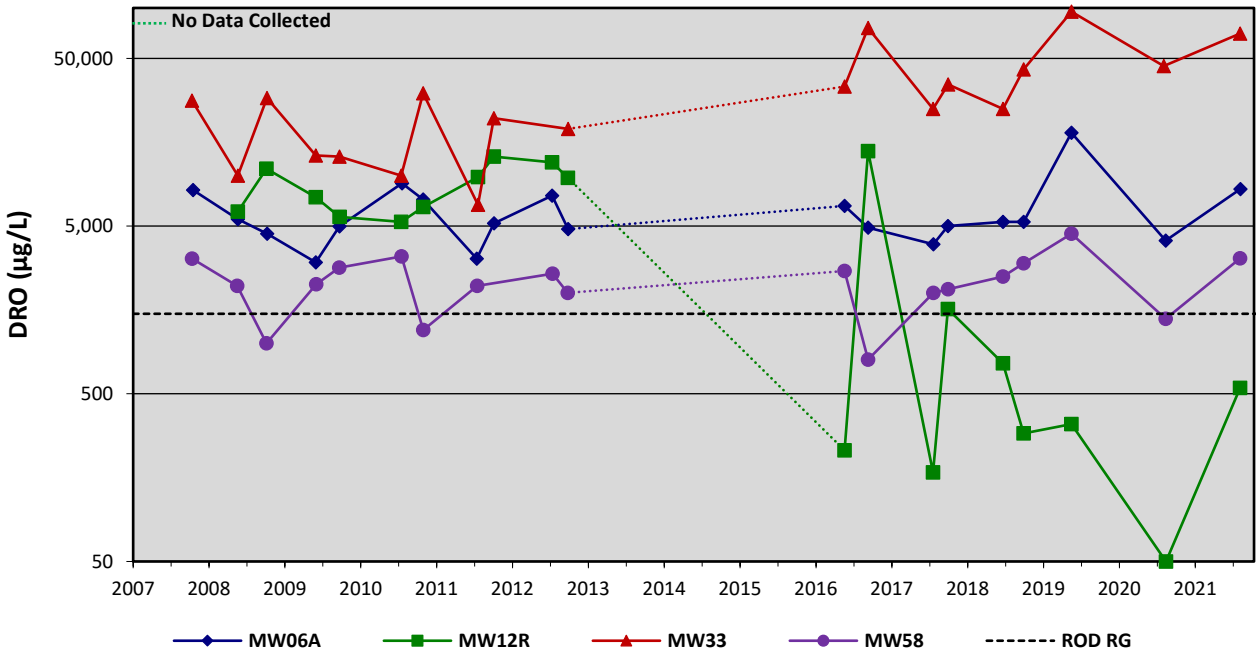
### 3.2.1 DRO and RRO in the Main DRO Plume

DRO concentrations exceeded the RG in main DRO plume wells MW06A, MW33, and MW58 in 2021. DRO has consistently exceeded the RG (1,500 micrograms per liter [µg/L]) in wells MW06A and MW33 since sampling began in 2007, with the highest concentrations observed in MW33 ranging between 6,700 and 95,000 J µg/L. DRO concentrations in MW58 (located downgradient of MW06A and MW33) have also exceeded the RG in nearly every sampling event, with highest concentration observed in 2019 at 4,500 µg/L. DRO periodically exceeds the RG in MW12R, with the last exceedance shown in 2017 at a concentration of 1,600 µg/L.

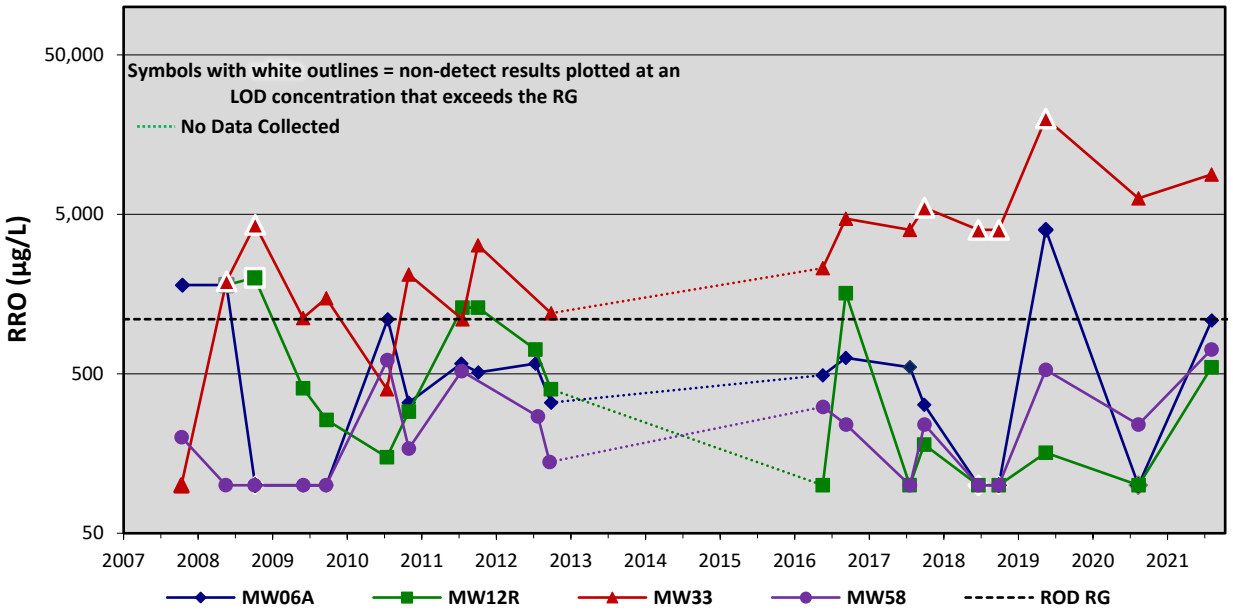
RRO exceeded the RG (1,100 µg/L) in one well, MW33, at a concentration of 8,890 J µg/L in 2021. RRO detections have been shown to sporadically exceed the RG in the four main DRO plume wells, with the majority of the exceedances observed in MW33.

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 RG. 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 with white outlines on Graph 3-2.

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



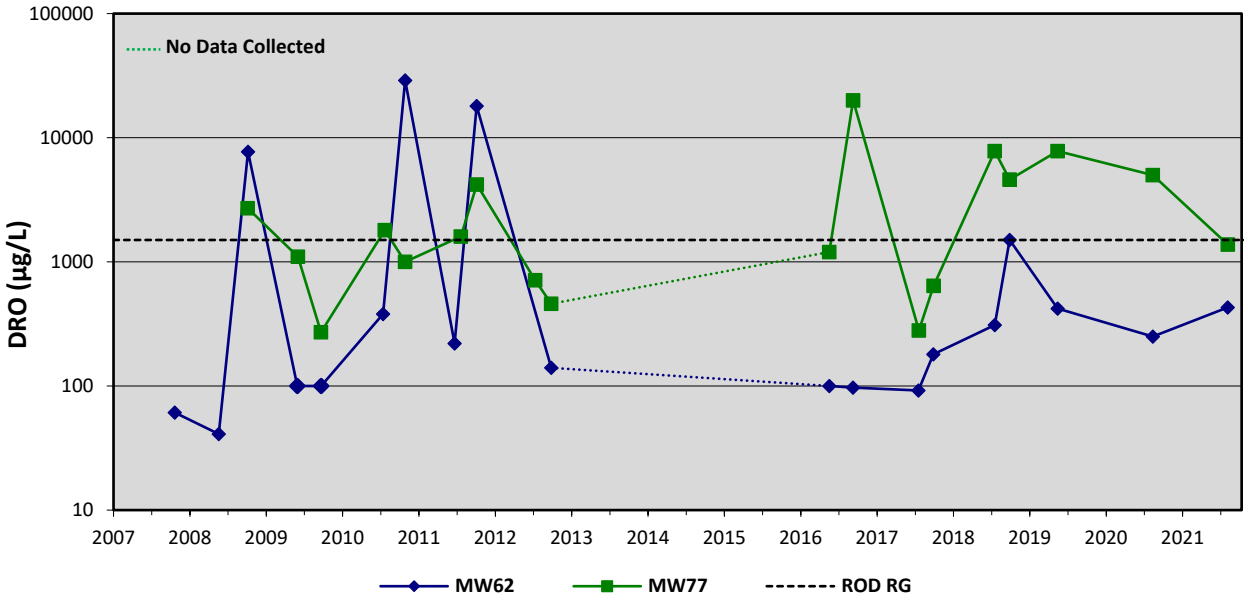
**Graph 3-2 RRO Concentrations in the Main DRO Plume**



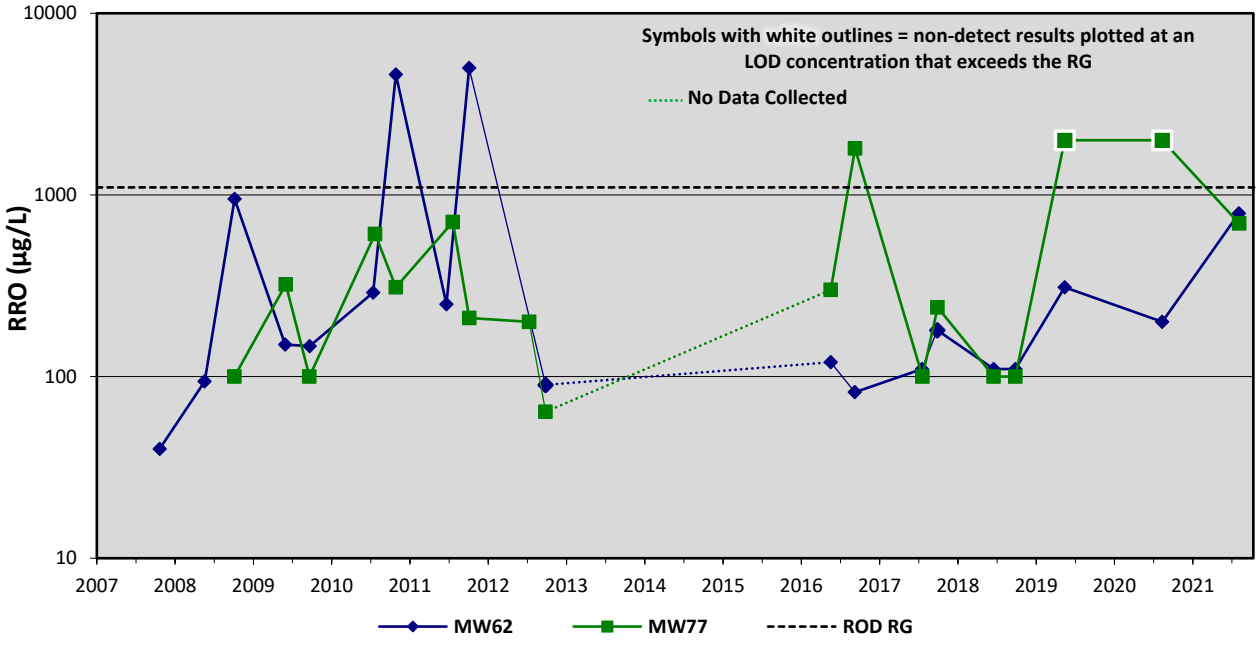

## 3.2.2 DRO and RRO in the Two Isolated DRO Plumes

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 did not exceed the RG in MW77 in 2021. However, well MW77 has exceeded the RG in four of the five most recent sampling events. The DRO concentration in MW62 equaled the RG during the September 2018 sampling event, but has been below the RG for the last three sampling events. Prior to 2018, the last DRO exceedance observed in MW62 was in 2011. RRO was below the RG but detected in 2021 in both wells. RRO last exceeded in wells MW62 and MW77 in 2011 and 2016, respectively, and since then RRO has been detected at concentrations approximately an order of magnitude below the RG or has not been detected. However, the non-detects in well MW77 during 2019 and 2020 had LODs above the RG. Graphs 3-3 and 3-4 present historical data collected at monitoring wells MW62 and MW77 for DRO and RRO, respectively, and the non-detect RRO results in MW77 during for the 2019 and 2020 sampling events are depicted with white outlines on Graph 3-4.

**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 RG in any sampling event.

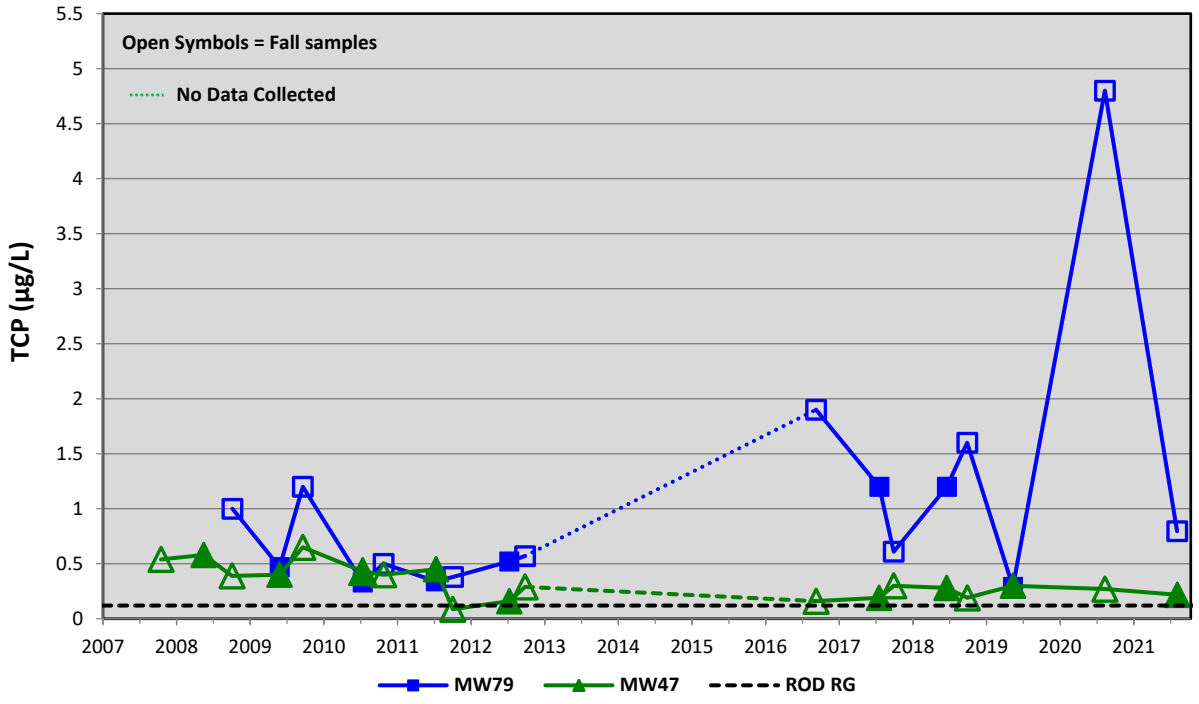
## 3.3 TCP Plume Sample Results

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 RG (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 exceeded the RG in MW79 and MW47 at a concentrations of 0.80 µg/L and 0.22 µg/L, respectively. Although TCP exceeds the RG 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 2021 and last exceeded the RG in 2012. TCP has never been detected in downgradient sentry wells MW78 and MW91.

TCP results between 2007 and 2021 are presented on Figure 3-3; and TCP and MNA parameters for 2018 through 2021 sampling events are presented in Table 3-3 (located at the end of Section 3).

**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 2021 sampling events are presented on Figure 3-4; and TCE (and associated daughter products) and MNA parameters for 2018 through 2021 sampling events are summarized in Table 3-3 (located at the end of Section 3).

TCE concentrations in MW61 have steadily declined since 2007 and last exceeded the RG (5 µg/L) in October 2010. TCE has never exceeded the RG 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 2021. However, all detections have remained below MCLs by approximately an order of 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). All field parameter results are presented on groundwater sampling forms and Table C-1 included in Appendix C. Laboratory analyses conducted in 2021 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). 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 2021 geochemical data is presented below.

- DO concentrations were relatively low (0.01 to 0.92 mg/L) in DRO plume wells with three exceptions: MW58 (9.42 mg/L), MW62 (8.24 mg/L), and MW82 (10.90 mg/L). The high DO value for well MW58 (located in the main DRO plume) is likely due to the presence of excessive air bubbles in the YSI instrument flow cell caused by a kink in the pump tubing. For wells MW62 and MW82 (located in the isolated DRO plume areas), excessive air bubbles in the flow cell were not observed; however, it is possible that an air bubble was trapped on the tip of the DO probe that

went unnoticed. DO results for other wells generated by the same instrument were less than 1 mg/L; therefore, the three elevated DO results were believed to be caused by operator error (i.e., air bubbles) and not instrument malfunction. Based on historical low DO results in wells site-wide, aerobic biodegradation would be anticipated to be limited.

- ORP values measured in all main DRO plume source area wells were negative, ranging from -106.0 to -133.3 millivolts (mV). ORP values in the other (less contaminated) DRO plume wells across the site range from +139.6 to -109.2 mV (only two of the seven wells not located in the main DRO plume had negative values). The greater negative ORP values within the main DRO plume are consistent with the conversion of oxygen and other electron acceptors to their reduced forms during biodegradation.
- Ferrous iron (identified by the dissolved [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 11.5 to 55.6 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 1.07 and 4.47 mg/L in the four main DRO plume wells, while the manganese concentration in background well MW13 was 0.846 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 6.12 and 31.3 mg/L in the four main DRO plume wells, compared to 49.1 mg/L in background well MW13. The lowest sulfate concentration of 6.12 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 (1.62 mg/L) and MW08 (2.69 mg/L) are slightly higher, but are within values that are typically observed in these wells. Other geochemical parameters such as ORP, dissolved iron and manganese, and sulfate did not indicate reductive dechlorination within the TCP plume.

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 CERCLA Sites Work Plan (Brice 2021); Postwide UFP-QAPP (Brice 2020); 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. The specific data quality issues found during the review are presented in the CDQR and ADEC Laboratory Data Review Checklists in Appendix B. The reviewed data are presented in Appendix A, Table A-2, and are used in tables and figures throughout the report.

**Table 3-1 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) | MAY-2019 | | AUG-2020 | | JULY-2021 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 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 | 16.17 | 434.44 | 13.11 | 437.50 | 15.30 | 435.31 |
| MW13 | Background | 19.2 | 9.2-19.2 | 452.05 | 16.95 | 435.10 | 13.83 | 438.22 | 15.92 | 436.13 |
| **DRO PLUME WELLS** | | | | | | | | | | |
| MW06A | Source Area | 22.7 | 12.5-22.5 | 450.73 | 16.55 | 434.18 | 13.55 | 437.18 | 15.82 | 434.91 |
| MW12R | Source Area | 22.5 | 12.4-22.4 | 447.66 | 13.39 | 434.27 | 10.30 | 437.36 | 12.59 | 435.07 |
| MW33 | Source Area | 20.9 | 10.8-20.8 | 450.64 | 16.42 | 434.22 | 13.36 | 437.28 | 15.65 | 434.99 |
| MW37 | Downgradient | 19.4 | 9.3-19.3 | 449.94 | 16.02 | 433.92 | 13.60 | 436.34 | 15.41 | 434.53 |
| MW58 | Source Area | 18.3 | 8.2-18.2 | 447.96 | 13.82 | 434.14 | 11.30 | 436.66 | 13.12 | 434.84 |
| MW62 | Source Area | 20.1 | 10.0-20.0 | 449.02 | 14.76 | 434.26 | 11.64 | 437.38 | 13.97 | 435.05 |
| MW64 | Downgradient | 20.1 | 10.0-20.0 | 449.58 | 15.33 | 434.25 | 12.30 | 437.28 | 14.59 | 434.99 |
| MW77 | Source Area | 22.7 | 12.6-22.6 | 452.62 | 18.61 | 434.01 | 15.63 | 436.99 | 17.96 | 434.66 |
| MW82 | Downgradient | 21.8 | 11.7-21.7 | 451.74 | 17.99 | 433.75 | 15.10 | 436.64 | 17.47 | 434.27 |
| **1,2,3-TCP PLUME WELLS** | | | | | | | | | | |
| MW08 | Upgradient | 22.2 | 12.1-22.1 | 453.61 | 18.77 | 434.84 | 15.70 | 437.91 | 17.90 | 435.71 |
| MW47 | Source Area | 19.8 | 9.8-19.8 | 451.27 | 16.72 | 434.55 | 13.68 | 437.59 | 15.64 | 435.63 |
| MW79 | Source Area | 21.6 | 11.5-21.5 | 453.45 | 18.79 | 434.66 | 15.77 | 437.68 | 18.05 | 435.40 |
| **TCE PLUME WELLS** | | | | | | | | | | |
| MW61 | Source Area | 20.2 | 10.1-20.1 | 449.88 | 15.46 | 434.42 | 12.46 | 437.42 | 14.72 | 435.16 |
| MW80 | Upgradient | 46.8 | 26.8-46.8 | 449.43 | 14.99 | 434.44 | 11.96 | 437.47 | 14.25 | 435.18 |
| **SENTRY WELLS** | | | | | | | | | | |
| MW78 | Sentry | 37.2 | 27.2-37.2 | 451.66 | 17.31 | 434.35 | 14.27 | 437.39 | 16.58 | 435.08 |
| MW91 | Sentry | 76.1 | 56.0-76.0 | 451.77 | 17.45 | 434.32 | 14.37 | 437.40 | 16.83 | 434.94 |

**Notes:**

For definitions, refer to the Acronyms and Abbreviations section.

**Table 3-2 2018-2021 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) |
| **ROD RGs[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) |
| | | 8/6/2021 | 0.24 | -109.2 | 13.6 | 0.804 | 43.8 | 276 J,B | 281 J,B |
| | 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 |
| | | 8/5/2021 | 0.67 | 22.9 | 0.988 | 0.846 | 49.1 | NA | NA |
| Main DRO Plume | MW12R | 6/20/2018 | 1.15 | -152.3 | 11.2 | 1.02 | 30.1 | 760 | ND(200) |
| | | 9/26/2018 | 1.51 | -109.0 | 9.32 | 0.897 | 33.4 | 290 | ND(200) |
| | | 5/14/2019 | 0.33 | -104.1 | 9.90 | 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) |
| | | 8/5/2021 | 0.01 | -132.2 | 11.5 | 1.07 | 31.3 | 542 J,B | 549 B |
| | 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** |
| | | 8/5/2021 | 0.33 | -133.3 | 55.1 | 4.47 | 6.12 | **70,300 J-** | **8,890** |
| | | 8/5/2021[2] | | | 55.6 | 4.47 | 6.12 | **58,900 J-** | **8,160** |
| | 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) |
| | | 8/6/2021 | 0.16 | -118.2 | 24.2 | 1.51 | 8.64 | **8,320** | 1,080 B |
| | 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[4] | 140.7 | 5.07 | 0.692 | 7.5 | 1,400 | 240 J |
| | | 8/5/2021 | 9.42[5] | -106.9 | 21.0 | 1.37 | 15.2 | **3,210 B** | 710 B |
| | 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[4] | 140.8 | 0.0585 B | 0.0380 | 32.2 | 290 | ND(200) |
| | | 8/6/2021 | 0.92 | 117.7 | ND(0.3) | 0.1110 | 12.6 | 236 J,B | ND(250) |
| 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 J,B | 0.832 | 27.8 | 250 | ND(200) |
| | | 8/5/2021 | 8.24[5] | 83.9 | ND(0.3) | 1.37 | 67.1 | 429 J,B | 791 B |
| | 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 | 10.9[4] | 123.7 | 0.0585 B | 0.0379 | 32.2 | 290 | ND(200) |
| | | 8/6/2021 | 0.20 | -71.3 | 2.43 | 0.322 | 11.1 | ND(306) | 325 J,B |
| | MW77 | 6/21/2018 | 0.42 | 47.6 | 0.251 | 1.11 | 64.3 | **7,800** | ND(1,000) |
| | | 9/27/2018 | 0.10 | 19.9 | ND(0.03) | 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) |
| | | 8/6/2021 | 0.23 | 119.4 | ND(0.3) | 0.583 | 42.1 | 1,380 B | 696 B |
| | 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[4] | 148.8 | 0.0607 B | 0.0250 | 11.2 | ND(50) | ND(200) |
| | | 8/6/2021 | 10.9[5] | 139.6 | ND(0.3) | 0.079 | 24.9 | ND(300) | 367 J,B |

**Notes:**

For definitions, refer to Acronyms and Abbreviations section

**Red and bold results exceed RGs**

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

[1] RG 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.

[4] Elevated DO concentrations in select wells in 2020 were due to a malfunctioning DO probe isolated to a single instrument.

[5] Elevated DO concentrations in select wells in 2021 was due to the presence of air bubbles in the purge water caused by operator error.

**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. If result is biased low or high, it is specified as "J-" and "J+".

ND - not detected (LOD presented in parentheses)

**Table 3-3 2018-2021 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) |
| **ROD RG[1,2]** | | | **NE** | **NE** | **NE** | **NE** | **NE** | **0.0075** | **5** | **70[2]** | **100[2]** | **2[2]** |
| Background | MW13 | 6/25/2018 | 2.32 | 31.6 | 1.00 | 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 |
| | | 8/5/2021 | 0.67 | 22.9 | 0.988 | 0.846 | 49.1 | 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[4] | 114.8 | ND(0.03) J- | 0.004 | 39.9 | **0.27** | NA | NA | NA | ND(0.02) |
| | | 8/5/2021 | 1.62 | 39.0 | ND(0.3) | 0.031 | 36.2 | **0.22** | NA | NA | NA | NA |
| | 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) |
| | | 8/4/2021 | 0.45 | 0.646 | 3.49 | 0.509 | 33.3 | **0.80** | NA | NA | NA | NA |
| | 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) |
| | | 8/5/2021 | 2.69 | 71.7 | ND(0.3) | 0.716 J | 54.5 | **0.016** | NA | NA | NA | NA |
| 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) |
| | | 8/5/2021 | 0.28 | -106.4 | 9.01 J+ | 1.57 | 41.0 | ND(0.005) | 1.1 | 7.5 | 7.1 | ND(0.08) |
| | | 8/5/2021[3] | | | 9.00 J+ | 1.58 | 40.8 | ND(0.005) | 1.1 | 7.8 | 7.5 | ND(0.08) |
| | 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) |
| | | 8/5/2021 | 0.07 | -130.1 | 10.1 | 0.919 | 31.2 | ND(0.005) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.08) |
| 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) |
| | | 8/4/2021 | 0.12 | -115.5 | NA | NA | NA | 0.00418 J | NA | NA | NA | NA |
| | 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) |
| | | 8/4/2021 | 0.11 | -137.5 | NA | NA | NA | ND(0.005) | NA | NA | NA | NA |

**Notes:**

For definitions, refer to Acronyms and Abbreviations section

**Red and bold results exceed RGs**

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

**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. If result is biased low or high, it is specified as "J-" and "J+".

ND - not detected (LOD presented in parentheses)

[1] RG 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.

[4] Elevated DO concentrations in select wells in 2020 were due to a malfunctioning DO probe isolated to a single instrument.

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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 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 2021 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 Alaska 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), sampling location optimization (for well redundancy), and sampling frequency optimization. The Mann-Kendall trends, spatial moment analysis, sampling location optimization, and sampling frequency optimization 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 RG 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), sampling location optimization, and sampling frequency optimization. The evaluation of RRO consisted of Mann-Kendall trends in individual wells only, since RRO has been detected above the RG 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 RG 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 | -63 | 0.90 | 98.6% | Decreasing |
| | | RRO | -13 | 1.14 | 66.1% | No Trend |
| MW33 | Source Area | DRO | 85 | 0.72 | 99.9% | **Increasing** |
| | | RRO | 64 | 1.16 | 98.7% | **Increasing** |
| MW06A | Downgradient | DRO | 13 | 0.52 | 65.0% | **No Trend (Stable)** |
| MW58 | Downgradient | DRO | 17 | 0.39 | 71.0% | **No Trend** |
| **ISOLATED DRO PLUME WELLS** | | | | | | |
| MW62 | Source Area | DRO | 40 | 2.45 | 91.3% | Probably Increasing (No Trend) |
| | | RRO | 32 | 2.22 | 85.9% | No Trend |
| MW77 | Source Area | DRO | 30 | 1.38 | 86.2% | **No Trend** |
| | | RRO | -20 | 1.23 | 76.2% | No Trend (Probably Decreasing) |

**Notes:**
For definitions, refer to the Acronyms and Abbreviations section.
**BOLD** indicates the concentration was above the RG in 2021 (or 2020).
[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 no trend in the downgradient wells (MW06A and MW58). MW33 has had the highest DRO concentrations within the main DRO plume, with concentrations consistently more than an order of magnitude higher than the RG. This suggests that the well is located in an area with residual NAPL in the soil that continues to be solubilized in the groundwater. MW06A, located immediately downgradient of MW33, had no trend (change from a stable trend the previous year) with DRO concentrations consistently above the RG. MW58 is downgradient from MW06A, and the DRO concentrations exhibit no trend, with variable detections above and below the RG since 2007 (the 2021 result was above the RG). Although not shown in Table 4-1, the DRO detections in further downgradient well MW37 are consistently below the RG. 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 RG in this well, with the highest concentration to date observed in the 2021 sampling event. RRO is either not detected or detected at trace concentrations in the upgradient and downgradient wells, with the exception of downgradient well MW06A. In 2021, RRO was just below the RG at 1,080 B µg/L in MW06A. The last sampling event where the RRO concentration was at a concentration near the RG in this well was in July 2010 at 1,100 µg/L. However, the 2021 result was qualified "B" as potential cross-contamination due to an elevated RRO result in the associated submersible pump equipment blank sample.

The DRO concentrations within the isolated DRO plumes exhibit no trend in well MW77 and a probably increasing trend in MW62. In MW62, DRO and RRO have been detected at or below the RG in ten consecutive sampling events (including 2021). 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 RG, indicating natural attenuation may have reduced groundwater contamination to below the RG upgradient of this well.

The DRO concentrations in MW77 exhibit no trend and were above the RG for four consecutive sampling events between 2018 and 2020, but marginally below the RG in 2021. The sampling events between 2018 and 2020 were the longest string of consecutive sampling events with DRO exceedances; however, the DRO concentrations in downgradient well MW82 remain below the RG.

Since RRO is not typically detected in MW62 and MW77, the Mann-Kendall analysis did not identify a trend.

### 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.

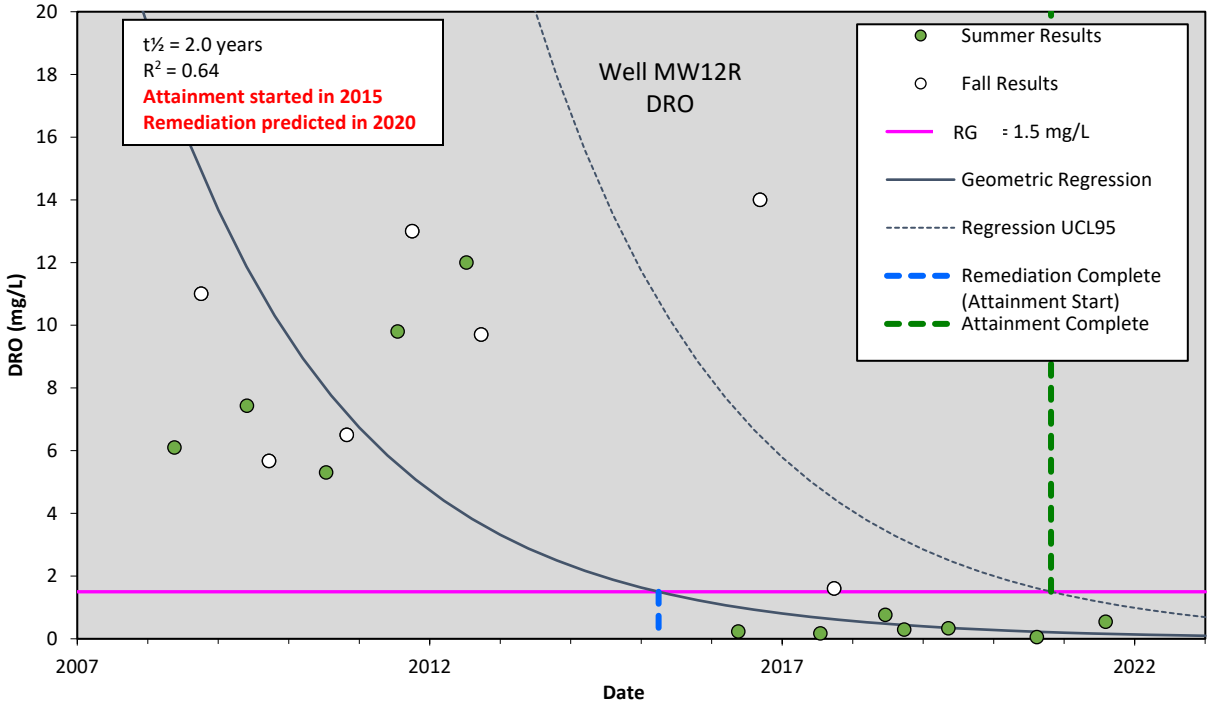
**Table 4-2 Statistical Evaluation of DRO in MW12R**

| WELL ID | TREND RESULT | NUMBER OF DATA POINTS | 95% UCL (mg/L) | HAS RG BEEN ACHIEVED? | YEAR EXPECTED TO ACHIEVE RG BASED ON 95% UCL? ("ATTAINMENT COMPLETE")[1] |
|---|---|---|---|---|---|
| MW12R | Decreasing | 19 | 10.5 | No | 2020 |

**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 RG 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 RG was achieved in 2020. This is an estimated date based on the data collected after remediation was completed in 2015. However, the EPA statistics tool shows that the RG has not been achieved (Table 4-2) and is most likely caused by the high concentration observed during the September 2016 sampling event. Although the RG has not been achieved under the EPA statistics tool, all samples collected after the September 2016 event were below or just marginally above the RG. In addition, the EPA statistics tool requires at least eight data points to run the analysis; therefore, beginning in 2022 the analyses could be conducted with the data collected beginning in 2017 to evaluate the time to achieve the RG.

**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 2021 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) | No Trend |
| Second Moment (Plume Spread)<br>*Parallel to Groundwater Flow*<br>*Perpendicular to Groundwater Flow* | <br>Stable<br>Stable |

**Notes:**
For definitions, refer to the Acronyms and Abbreviations section.
[1] Based on monitoring results between 2016 and 2021.

The plume stability results indicate there is no trend for the dissolved DRO mass since 2016. There has been wide variation in DRO concentrations over time in several wells due to fluctuations in groundwater elevations and residual NAPL remaining in source area soils; however, this has not resulted in a significant change in overall dissolved mass within the DRO plume. The first moment results indicate there is no trend in the distance from the source to the center of mass since 2016. 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 2021 the center of mass has varied between 142 and 214 feet from the source.

The second moment results indicate stable trends in the plume spread parallel and perpendicular to groundwater flow. These results suggest there is no downgradient migration of DRO above the RG from the source area, since no exceedances of the RG 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 2021 were lower than the 2020 sampling event, and in general, DRO concentrations were higher in 2021. 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 | -57 | 0.57 | 98.4% | **Decreasing** |
| MW79 | Source Area | TCP | 40 | 1.09 | 94.6% | **Probably Increasing** |

**Notes:**
For definitions, refer to the Acronyms and Abbreviations section.
**BOLD** indicates the concentration was above the RG in 2021 (or 2020).

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 RG in both wells during 2021, and have been consistently detected above the RG since analysis began in 2007. However, TCP has remained below the RG outside of the TCP plume (including upgradient wells, and wells that are in the downgradient, but slightly crossgradient direction), suggesting minimal plume spread from the source area.

### 4.3.2 TCP Trend Analysis Using EPA Groundwater Statistics Tool

The TCP concentrations in MW47 were further evaluated using the EPA Groundwater Statistics tool since the concentrations exhibited a decreasing trend. MW79 was not evaluated since the well does not have a decreasing TCP trend. The TCP concentration in MW08 was also evaluated, since this upgradient well has had several RG 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.

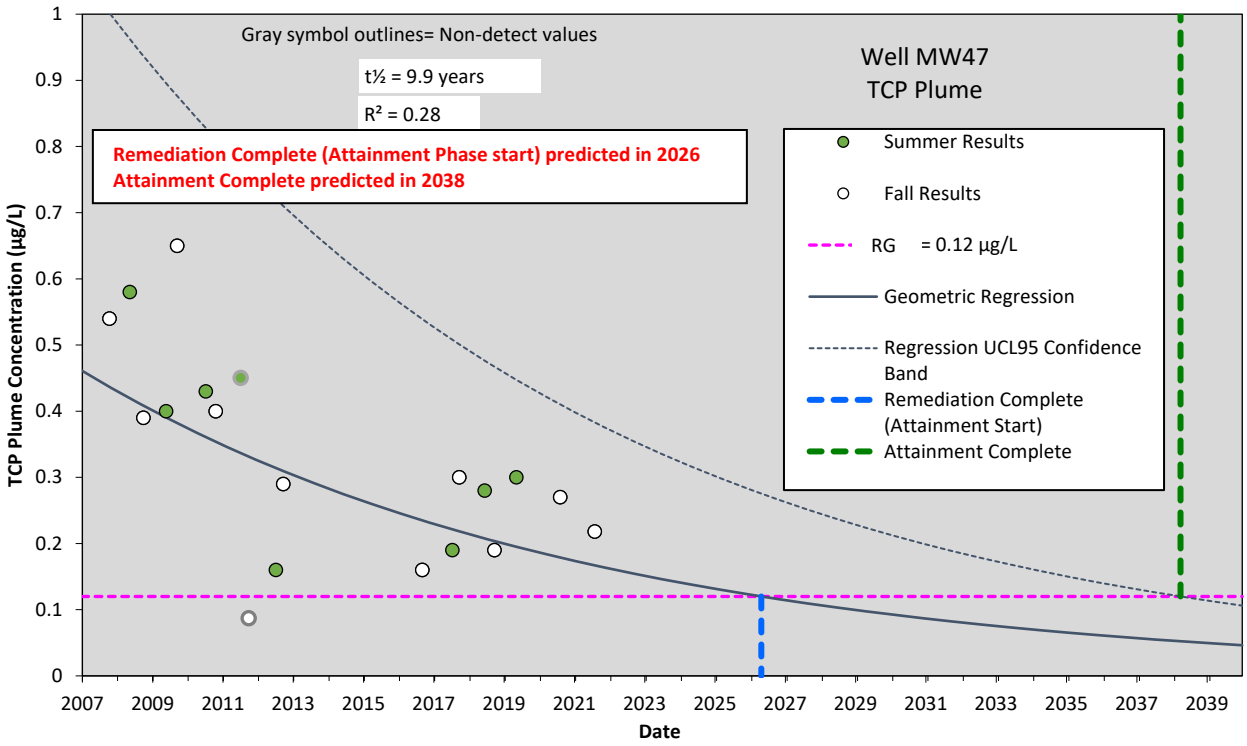
**Table 4-5 Statistical Evaluation of TCP in MW47 and MW08**

| WELL ID | TREND RESULT | NUMBER OF DATA POINTS | 95% UCL (µg/L) | HAS RG BEEN ACHIEVED? | YEAR EXPECTED TO ACHIEVE RG BASED ON 95% UCL? ("Attainment Complete")[1] |
|---|---|---|---|---|---|
| MW47 | Decreasing | 18 | 0.49 | No | 2038 |
| MW08 | Decreasing | 16 | 0.11 | 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 RG in 2038 (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 RG 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 RG 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 | -126 | 1.01 | 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.

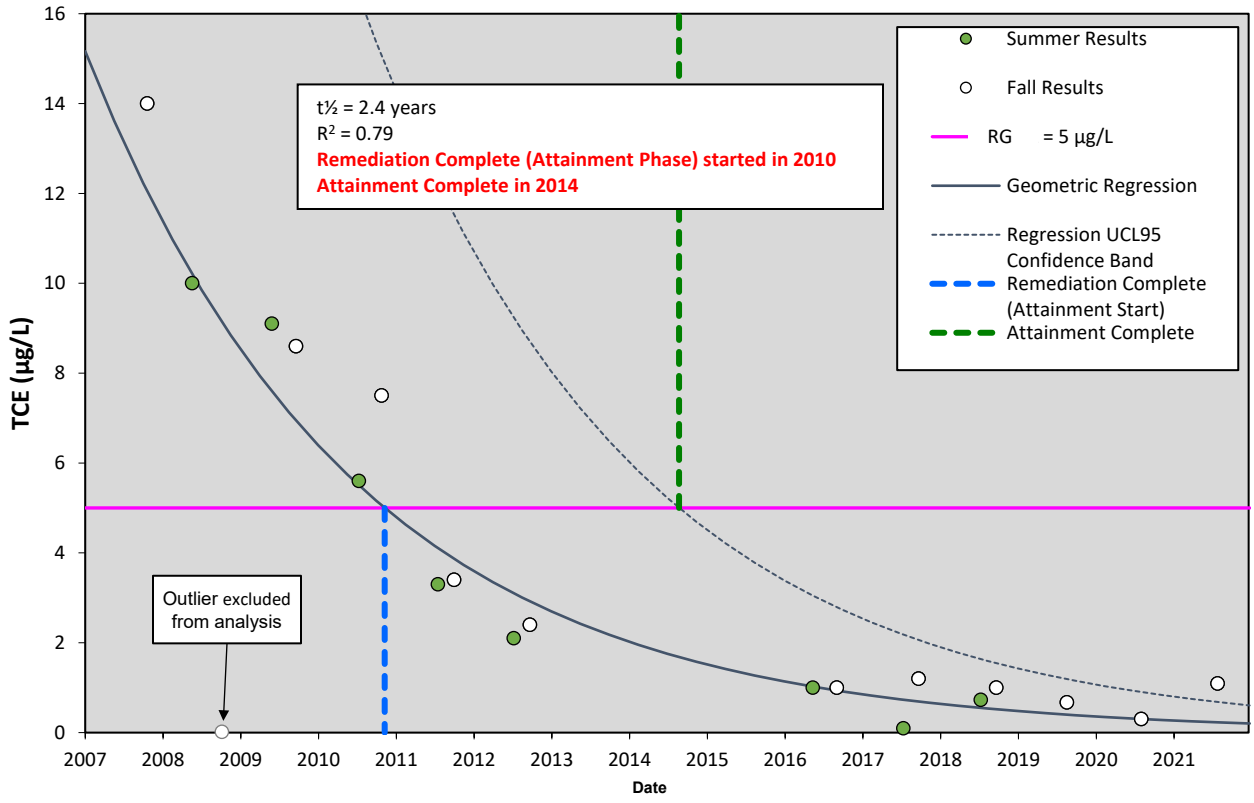
**Table 4-7 Cleanup Complete Evaluation for TCE in MW61**

| WELL ID | TREND RESULT | NUMBER OF DATA POINTS[1] | 95% UCL (µg/L) | ACHIEVE RG? |
|---|---|---|---|---|
| MW61 | Decreasing | 13 | 2.69 | 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 shading** indicates the RG has been achieved and will continue to achieve at a 95% confidence limit
[1] Number of data points represents the attainment phase.

The Cleanup Complete evaluation was completed using results from the attainment phase, or when TCE concentrations remained below the RG beginning in 2011. The results show the 95% UCL is less than the RG 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 RG 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 2021 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 higher in 2021 compared to 2020, most likely the result of lower groundwater elevations encountered during the 2021 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 RG, 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 (met in 2020 based on geometric regression) 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 RG in 2021 and has only exceeded the RG once since 2012. Assuming DRO remains below the RG in MW62 in 2022, the cleanup attainment timeframe could be calculated following the EPA guidance (EPA 2014b). DRO concentrations in MW77, while highly variable, exceeded the RG from the 2018 through 2020 sampling events, but did not exceed the RG in the 2021 sampling event.

## 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 RG. TCP concentrations in MW47 have a decreasing Mann-Kendall trend while MW79 has a probably increasing trend. The probably increasing between 2019 and 2021 was a result of the significantly elevated 2020 TCP concentration. The TCP concentration in 2020 was more than two times higher than the maximum detection between 2008 and 2019. Although the TCP trend in MW79 remains as a probably increasing trend in 2021, the TCP concentration was lower in 2021 than in 2020, and was similar to concentrations observed in past sampling events. TCP has remained below the RG 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 RG 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 RG since 2011, and TCE has never exceeded the RG 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 RG has been achieved in accordance with EPA requirements (EPA 2014b).

## 5.4 Recommendations

It is recommended that consideration be made to remove the wells listed below from the OU6 monitoring well program.

- TCE plume wells MW61 and MW80: Although TCE is typically detected in well MW61, it has remained below the RG for 11 years, over 13 sampling events. Statistical analysis shows the remedial goal was achieved in 2014. Moreover, TCE daughter products have not exceeded EPA MCLs. TCE in well MW80 has never exceeded the RG since its installation and has not been detected for 11 years.
- Background wells MW03 and MW13: Background concentrations at this site have been well established and continued sampling of these wells does not provide additional benefit to the monitoring program.

No other changes to the monitoring program are recommended at this time.

# 6.0 REFERENCES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# FIGURES

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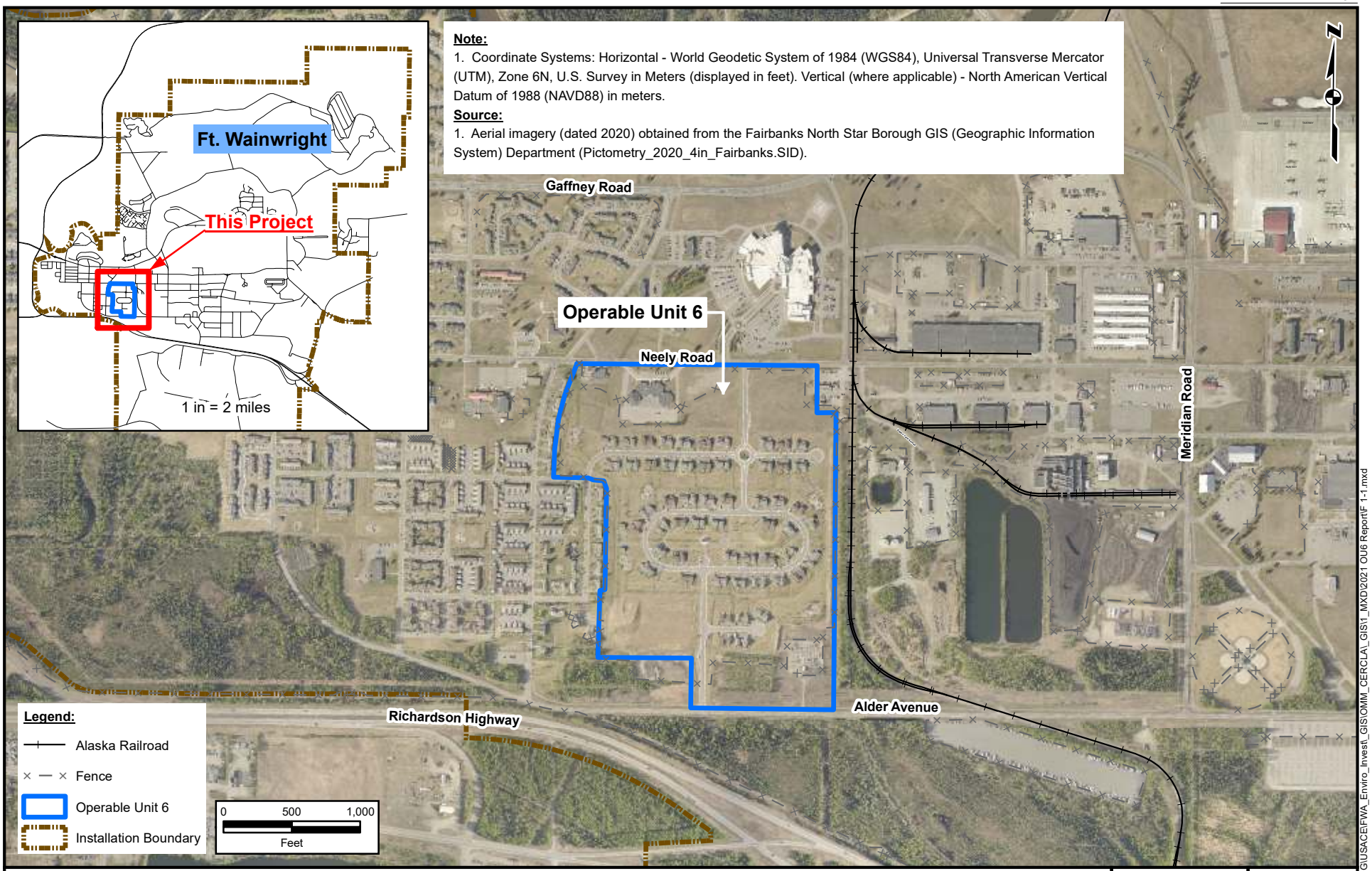


# 2021 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

## SITE LOCATION AND VICINITY

DATE: 6/17/2022

Project No.: 551229

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

Main DRO Plume Wells

MW77

Backup Water Supply Well (Building 3563)

Water Supply Well (Building 3559)

MW58

Isolated DRO Plumes

MW06A

MW64

Approximate Groundwater Flow Direction

Sentry Wells

MW62

MW78

MW91

4723

MW33

4713

4711

4709

4707

MW12R

MW47

4712

MW61

MW80

MW79

TCP Plume Wells

TCE Plume Wells

4743

4741

MW08

4755

4744

4745

Tanana Trails Subdivision

MW03

MW13

**Legend:**

- DRO Plume Well
- TCE Plume Well
- TCP Plume Well
- Sentry Well
- Background Well
- Approximate Location of Decon Water Discharge Point
- 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 (dated 2020) obtained from the Fairbanks North Star Borough GIS (Geographic Information System) Department (Pictometry_2020_4in_Fairbanks.SID).

0 105 210

Feet

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2021 OU6 Report\F 2-1.mxd

2021 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

## GROUNDWATER MONITORING WELLS SAMPLED IN 2021

PROJECT No.: 551229

DATE: 10/26/2021

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

FIGURE: 2-1

1 INCH

N

Bassett Army Hospital

9th Street

10th Street

Neely Road

Hackberry Street

Backup Water Supply Well (Building 3563)

Water Supply Well (Building 3559)

Tanana Trails Subdivision

MW82 434.27

MW37 434.53

MW77 434.66

MW58 434.84

MW06A 434.91

MW64 434.99

MW33 434.99

MW62 435.05

MW12R 435.07

MW61 435.16

MW80 435.18

MW03 435.31

MW13 436.13

MW91 434.94

MW78 435.08

MW47 435.63

MW79 435.40

MW08 435.71

434.40

434.60

434.80

435.00

435.20

435.40

435.60

435.80

436.00

Approximate Groundwater Flow Direction

**Legend:**

- Monitoring Well Sampled in 2021 - Groundwater Elevation in NAVD88, Feet
- Groundwater Monitoring Well Groundwater Elevation was not used in Contour Calculation
- 436.00 Groundwater Elevation Contour - 13 July 2021, Contour Interval = 0.2 feet
- Railroad
- Fence

**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 (dated 2020) obtained from the Fairbanks North Star Borough GIS (Geographic Information System) Department (Pictometry_2020_4in_Fairbanks.SID).

0 105 210
Feet

# 2021 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

## GROUNDWATER ELEVATION CONTOURS

PROJECT No.: 551229

DATE: 10/22/2021

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

FIGURE: 3-1

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1 INCH

N

Bassett Army Hospital

9th Street

MW82

| MW77 12.6-22.6' btoc | Oct 2008 | June 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | July 2012 | Sept 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *434.01* | *436.99* | *434.66* |
| 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** | 1,380 |
| 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)* | 696 |

| MW58 8.2-18.2' btoc | Oct 2007 | May 2008 | Oct 2008 | June 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | July 2012 | Sept 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *436.49* | *437.73* | *434.14* | *436.66* | *434.84* |
| 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 | **3,210** |
| 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 | 710 |

Neely Road

MW37

MW77

Isolated DRO Plume

| MW33 10.8-20.8' btoc | Oct 2007 | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | Sept 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - |
| DRO | **28,000** | **10,000** | **29,000** | **13,200** | **13,000** | **10,000** | **31,000** | **6,700** | **22,000** | **19,000** |
| RRO | ND(840) | ND(1,900)* | ND(4,300)* | **1,120** | **1,490** | 400 | **2,100** | **1,100** | **3,200** | **1,200** |

| MW33 10.8-20.8' btoc | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | *435.80* | *436.98* | *434.22* | *437.28* | *434.99* |
| DRO | **34,000** | **76,000** | **35,000** | **25,000** | **25,000** | **39,000** | **95,000** | **55,000** | **70,300** |
| RRO | **2,300** | **4,700** | **4,000** | ND(5,500)* | ND(4,000)* | ND(4,000)* | ND(20,000)* | **6,300** | **8,890** |

Main DRO Plume Wells

MW58

MW06A

MW64

MW62

Isolated DRO Plume

MW33

MW12R

Approximate Groundwater Flow Direction

MW47

MW61

MW80

| MW06A 12.5-22.5' btoc | Oct 2007 | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | July 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| *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 |

| MW06A 12.5-22.5' btoc | Sept 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | *435.95* | *437.14* | *434.18* | *437.18* | *434.91* |
| DRO | **4,800** | **6,600** | **4,900** | **3,900** | **5,000** | **5,300** | **5,300** | **18,000** | **4,100** | **8,320** |
| RRO | 330 | 490 | 630 | ND(550) | 320 | ND(1,000) | ND(400) | ND(4,000)* | ND(1,000) | 1,080 |

| MW12R 12.4-22.4' btoc | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | July 2012 | Oct 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *434.27* | *437.36* | *435.07* |
| 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) | 542 |
| 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) | 549 |

Tanana Trails Subdivision

MW03

| MW62 10.0-20.0' btoc | Oct 2007 | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | Oct 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *436.04* | *437.33* | *434.26* | *437.38* | *435.05* |
| 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 | 429 |
| 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) | 791 |

MW13

| PCL (µg/L) | |
|---|---|
| DRO | 1,500 |
| RRO | 1,100 |

**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 (dated 2020) obtained from the Fairbanks North Star Borough GIS (Geographic Information System) Department (Pictometry_2020_4in_Fairbanks.SID).

**Acronyms and Abbreviations**

btoc - below top of casing
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 2021 (Non DRO Plume Well)

DRO Plume Monitoring Well Sampled in 2021

Fence

0 90 180
Feet

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2021 OU6 Report\F 3-2.mxd

# 2021 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

## DRO PLUME GROUNDWATER SAMPLE RESULTS

PROJECT No.: 551229

DATE: 10/22/2021

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

FIGURE: **3-2**

1 INCH

N

Bassett Army Hospital

MW82

Neely Road

MW37

MW77

MW58

MW06A

MW64

MW62

MW33

MW12R

MW61

MW80

MW47

MW91

MW78

MW79

MW08

Water Supply Well (Building 3559)

Approximate Groundwater Flow Direction [6]

TCP Plume Wells

Tanana Trails Subdivision

MW13**

| MW91 56.0-76.0' btoc | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | *434.32* | *437.40* | *434.94* |
| TCP | ND(0.003) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) |

| MW78 27.2-37.2' btoc | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | *434.35* | *437.39* | *435.08* |
| TCP | 0.0062 | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | 0.0042 |

| MW47 9.8-19.8' btoc | Oct 2007 | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | June 2012 | Sept 2012 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *436.32* | *437.35* | *434.55* | *437.59* | *435.63* |
| TCP | **0.54** | **0.59** | **0.50** | **0.51** | **0.65** | **0.43** | **0.40** | ND(0.5)* | 0.09 | **0.59** | **0.29** | **0.16** | **0.19** | **0.30** | **0.28** | **0.20** | **0.31** | **0.27** | **0.22** |

| MW79 11.5-21.5' btoc | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | June 2012 | Sept 2012 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *434.66* | *437.68* | *435.40* |
| 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** | **0.796** |

| MW08 12.1-22.1' btoc | Oct 2007 | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | July 2012 | Sept 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *436.77* | *437.76* | *434.84* | *437.91* | *435.71* |
| TCP | ND(0.3)* | 0.02 | **0.23** | 0.02 | 0.03 | ND(0.3)* | ND(0.5)* | ND(0.5)* | 0.06 | **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) | 0.016 |

| MW13** 9.2-19.2' btoc | Oct 2007 | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | Oct 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | May 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *436.27* | *437.37* | *435.10* | *438.22* | *436.13* |
| 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) | ND(0.005) |

**Notes:**

1. Results shown in **red** equal or exceed the ROD RG.
2. The RG 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 ROD RG.
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 groundwater flow direction in the vicinity of the Building 3559 is to the N-NW (more northerly than the NW regional groundwater flow direction) due to the influence of the water supply well.
7. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
8. Only sample results for wells that have exceeded the ROD RG since 2007 are shown.
9. Data flags (qualifiers) are not shown due to space limitations.
10. 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 (dated 2020) obtained from the Fairbanks North Star Borough GIS (Geographic Information System) Department

**Legend:**

- TCP Plume Monitoring Well Sampled in 2021
- Sentry Well Sampled for TCP in 2021
- Monitoring Well Sampled in 2021 (Non TCP Plume Well)
- Railroad
- Fence

**Acronyms and Abbreviations**

btoc - below top of casing
LOD - limit of detection
ND - not detected (LOD presented in parenthesis)
ROD - Record of Decision
RG - remedial goal
ROD - Record of Decision
TCP - 1,2,3-trichloropropane
µg/L - micrograms per liter

| ROD RG (µg/L) | |
|---|---|
| TCP | 0.12 |

0 90 180
Feet

# 2021 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

## TCP PLUME GROUNDWATER SAMPLE RESULTS

PROJECT No.: 551229

DATE: 6/29/2022

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

FIGURE: 3-3

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1 INCH

N

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 10.1-20.1' btoc | Oct 2007 | May 2008 | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | June 2012 | Sept 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | Aug 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *437.42* | *435.16* |
| 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 | 1.1 |

| MW80 36.8-46.8' btoc | Oct 2008 | May 2009 | Sept 2009 | July 2010 | Oct 2010 | July 2011 | Oct 2011 | June 2012 | Sept 2012 | May 2016 | Sept 2016 | July 2017 | Sept 2017 | June 2018 | Sept 2018 | Aug 2019 | Aug 2020 | Aug 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *GW Elev (ft)* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *437.47* | *435.18* |
| TCE | ND(0.01) | 0.02 | 0.03 | 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) | ND(0.5) |

**Notes:**

1. Results shown in **red** equal or exceed the ROD RG.
2. The RG 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 ROD RG 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 (dated 2020) obtained from the Fairbanks North Star Borough GIS (Geographic Information System) Department (Pictometry_2020_4in_Fairbanks.SID).

| ROD RG (µg/L) | |
|---|---|
| TCE | 5 |

**Acronyms and Abbreviations**

btoc - below top of casing
LOD - Limit of Detection
ND - Not Detected (LOD presented in parenthesis)
ROD - Record of Decision
RG - remedial goal
ROD - Record of Decision
TCE - Trichloroethene
µg/L - micrograms per liter

**Legend:**

- TCE Plume Monitoring Well Sampled in 2021
- Monitoring Well Sampled in 2021 (Non TCE Plume Well)
- Railroad
- Fence

0 90 180
Feet

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2021 OU6 Report\F 3-4 - Copy.mxd

# 2021 OPERABLE UNIT 6 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

## TCE PLUME GROUNDWATER SAMPLE RESULTS

PROJECT No.: 551209

DATE: 1/27/2022

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

FIGURE: **3-4**

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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) | Dissolved Iron and Manganese | Sulfate (E300.0) | VOCs (SW8260D) | Low-Level VOCs (SW8260DSIM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21FWOU601WG | MW78 | N | GW | 28.0 | 08/04/21 13:45 | CB | 1215046 | SGS | 080901 | | | | | | X |
| 21FWOU602WG | MW91 | N | GW | 56.9 | 08/04/21 15:10 | CB | 1215046 | SGS | 080901 | | | | | | X |
| 21FWOU603WG | MW47 | N | GW | 17.0 | 08/04/21 16:55 | CB | 1215046 | SGS | 080901 | | | X | X | | X |
| 21FWOU604WG | MW79 | N | GW | 19.1 | 08/04/21 18:20 | CB | 1215046 | SGS | 080901 | | | X | X | | X |
| 21FWOU605WG | MW58 | N | GW | 14.2 | 08/05/21 11:10 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU606WG | MW33 | N/MS/MSD | GW | 16.8 | 08/05/21 12:30 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU607WG | AP-1010 | FD of 21FWOU606WG | GW | 16.8 | 08/05/21 12:45 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU608WG | MW62 | N | GW | 15.1 | 08/05/21 14:15 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU609WG | MW12R | N | GW | 13.7 | 08/05/21 15:25 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU610WG | MW13 | N | GW | 17.1 | 08/05/21 10:55 | CB/TA | 1215046 | SGS | 080901 | | | X | X | | X |
| 21FWOU611WG | MW80 | N | GW | 37.7 | 08/05/21 12:40 | CB/TA | 1215046 | SGS | 080901 | | | X | X | X | X |
| 21FWOU612WG | MW61 | N/MS/MSD | GW | 15.8 | 08/05/21 13:50 | CB/TA | 1215046 | SGS | 080901 | | | X | X | X | X |
| 21FWOU613WG | AP-2020 | FD of 21FWOU612WG | GW | 15.8 | 08/05/21 14:05 | CB/TA | 1215046 | SGS | 080901 | | | X | X | X | X |
| 21FWOU614WG | MW08 | N | GW | 19.0 | 08/05/21 15:35 | CB/TA | 1215046 | SGS | 080901 | | | X | X | | X |
| 21FWOU615WG | MW06A | N | GW | 16.9 | 08/06/21 10:15 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU616WG | MW77 | N | GW | 19.1 | 08/06/21 11:25 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU617WG | MW82 | N | GW | 18.6 | 08/06/21 12:45 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU618WG | MW64 | N | GW | 15.8 | 08/06/21 10:45 | TA | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU619WG | MW37 | N | GW | 16.5 | 08/06/21 13:10 | TA | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU620WG | MW03 | N | GW | 16.5 | 08/06/21 14:25 | JS/TA | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU6EB01WQ | OU6-EB01 | EB | WQ | -- | 08/05/21 17:00 | CB | 1215046 | SGS | 080901 | | | X | X | X | X |
| 21FWOU6EB02WQ | OU6-EB02 | EB | WQ | -- | 08/06/21 17:30 | JS | 1215007 | SGS | Brice05 | X | X | X | X | | |
| 21FWOU6TB01WQ | OU6-TB01 | TB | WQ | -- | 08/04/21 08:00 | JS | 1215046 | SGS | 080901 | | | | | X | X |

**Notes:**

All samples are associated with NPDL 21-088.

All sample results were submitted to SGS of Anchorage, AK analyzed on standard turnaround time.

btoc - below top of casing
CB - Chris Boese
DRO - diesel range organics
EB - equipment blank
FD - field duplicate
GW - groundwater
HCl - hydrochloric acid
HDPE - high density polyethylene
HNO3 - nitric acid
ID - identification
JS - Jill Stockbridge
mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
N - normal environmental sample
NPDL - North Pacific Division Laboratory
RRO - residual range organics
SDG - sample delivery group
SGS - SGS North America, Inc
TA- Tracy Asicksik
TB - trip blank
VOA - volatile organic analysis
VOC - volatile organic compounds
WQ - water QC

Water Sample Collection (all samples were field-preserved at 0 to 6 °C)
DRO/RRO - two HCl-preserved, 250 mL amber bottles
Dissolved Iron and Manganese - one HNO3-preserved, 125 mL HDPE bottle
Sulfate - one non-preserved, 125 mL HDPE bottle
VOC - three HCl-preserved, 40 mL VOA vials
Low-Level VOC - three HCl-preserved, 40 mL VOA vials

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

| | | | | Sample ID | 21FWOU601WG | 21FWOU602WG | 21FWOU603WG | 21FWOU604WG | 21FWOU605WG | 21FWOU606WG | 21FWOU607WG | 21FWOU608WG | 21FWOU609WG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Location ID | MW78 | MW91 | MW47 | MW79 | MW58 | MW33 | AP-1010 | MW62 | MW12R |
| | | | | Lab SDG | 1215046 | 1215046 | 1215046 | 1215046 | 1215007 | 1215007 | 1215007 | 1215007 | 1215007 |
| | | | | Collection Date | 8/4/2021 1:45:00 PM | 8/4/2021 3:10:00 PM | 8/4/2021 4:55:00 PM | 8/4/2021 6:20:00 PM | 8/5/2021 11:10:00 AM | 8/5/2021 12:30:00 PM | 8/5/2021 12:45:00 PM | 8/5/2021 2:15:00 PM | 8/5/2021 3:25:00 PM |
| | | | | Matrix | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater |
| | | | | QC Type | Primary | Primary | Primary | Primary | Primary | Primary | Duplicate | Primary | Primary |
| **Method** | **Analyte1** | **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** | 1500 | NE | µg/L | -- | -- | -- | -- | **3210 [294] B** | **70300 [294] J-** | **58900 [300] J-** | 429 [300] J,B | 542 [294] J,B |
| AK103 | **Residual Range Organics** | 1100 | NE | µg/L | -- | -- | -- | -- | 710 [245] B | **8890 [245]** | **8160 [250]** | 791 [250] B | 549 [245] B |
| E300.0 | Sulfate | NE | NE | µg/L | -- | -- | 36200 [1000] | 33300 [1000] | 15200 [1000] | 6120 [1000] | 6120 [1000] | 67100 [2500] | 31300 [1000] |
| SW6020B | Iron | NE | NE | µg/L | -- | -- | ND [250] | 3490 [250] | 21000 [250] | 55100 [1250] | 55600 [1250] | ND [250] | 11500 [250] |
| SW6020B | Manganese | NE | NE | µg/L | -- | -- | 31.2 [1.00] | 509 [1.00] | 1370 [1.00] | 4470 [5.00] | 4470 [5.00] | 1370 [1.00] | 1070 [1.00] |
| SW8260D | 1,1-Dichloroethene | NE | 7 | µg/L | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SW8260D | cis-1,2-Dichloroethene | NE | 70 | µg/L | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SW8260D | Tetrachloroethene | NE | 5 | µg/L | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SW8260D | trans-1,2-Dichloroethene | NE | 100 | µg/L | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SW8260D | **Trichloroethene** | 5 | 5 | µg/L | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SW8260D | Vinyl chloride | NE | 2 | µg/L | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SW8260DSIM | **1,2,3-Trichloropropane** | 0.0075 | NE | µg/L | 0.00418 [0.00500] J | ND [0.00500] | **0.218 [0.00500]** | **0.796 [0.00500]** | -- | -- | -- | -- | -- |

**Notes:**

[1] **OU6 ROD analytes are identified in blue bold 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.**

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,
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 | 21FWOU610WG | 21FWOU611WG | 21FWOU612WG | 21FWOU613WG | 21FWOU614WG | 21FWOU615WG | 21FWOU616WG | 21FWOU617WG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Location ID | MW13 | MW80 | MW61 | AP-2020 | MW08 | MW06A | MW77 | MW82 |
| | | | | Lab SDG | 1215046 | 1215046 | 1215046 | 1215046 | 1215046 | 1215007 | 1215007 | 1215007 |
| | | | | Collection Date | 8/5/2021 10:55:00 AM | 8/5/2021 12:40:00 PM | 8/5/2021 1:50:00 PM | 8/5/2021 2:05:00 PM | 8/5/2021 3:35:00 PM | 8/6/2021 10:15:00 AM | 8/6/2021 11:25:00 AM | 8/6/2021 12:45:00 PM |
| | | | | Matrix | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater | Groundwater |
| | | | | QC Type | Primary | Primary | Primary | Duplicate | Primary | Primary | Primary | Primary |
| Method | Analyte1 | 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** | 1500 | NE | µg/L | -- | -- | -- | -- | -- | **8320 [294]** | 1380 [300] B | ND [300] |
| AK103 | **Residual Range Organics** | 1100 | NE | µg/L | -- | -- | -- | -- | -- | 1080 [245] B | 696 [250] B | 367 [250] J,B |
| E300.0 | Sulfate | NE | NE | µg/L | 49100 [1000] | 31200 [500] | 41000 [500] | 40800 [1000] | 54500 [1000] | 8640 [1000] | 42100 [1000] | 24900 [1000] |
| SW6020B | Iron | NE | NE | µg/L | 988 [250] | 10100 [250] | 9010 [250] J+ | 9000 [250] J+ | ND [250] | 24200 [250] | ND [250] | ND [250] |
| SW6020B | Manganese | NE | NE | µg/L | 846 [1.00] | 919 [1.00] | 1570 [1.00] | 1580 [1.00] | 0.716 [1.00] J | 1510 [1.00] | 583 [1.00] | 78.6 [1.00] |
| SW8260D | 1,1-Dichloroethene | NE | 7 | µg/L | -- | ND [0.500] | ND [0.500] | ND [0.500] | -- | -- | -- | -- |
| SW8260D | cis-1,2-Dichloroethene | NE | 70 | µg/L | -- | ND [0.500] | 7.48 [0.500] | 7.79 [0.500] | -- | -- | -- | -- |
| SW8260D | Tetrachloroethene | NE | 5 | µg/L | -- | ND [0.500] | ND [0.500] | ND [0.500] | -- | -- | -- | -- |
| SW8260D | trans-1,2-Dichloroethene | NE | 100 | µg/L | -- | ND [0.500] | 7.13 [0.500] | 7.49 [0.500] | -- | -- | -- | -- |
| SW8260D | **Trichloroethene** | 5 | 5 | µg/L | -- | ND [0.500] | 1.07 [0.500] | 1.09 [0.500] | -- | -- | -- | -- |
| SW8260D | Vinyl chloride | NE | 2 | µg/L | -- | ND [0.0750] | ND [0.0750] | ND [0.0750] | -- | -- | -- | -- |
| SW8260DSIM | **1,2,3-Trichloropropane** | 0.0075 | NE | µg/L | ND [0.00500] | ND [0.00500] | ND [0.00500] | ND [0.00500] | **0.0163 [0.00500]** | -- | -- | -- |

**Notes:**

[1] **OU6 ROD analytes are identified in blue bold 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.**

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,
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 | 21FWOU618WG | 21FWOU619WG | 21FWOU620WG | 21FWOU6EB01WQ | 21FWOU6EB02WQ | 21FWOU6TB01WQ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Location ID | MW64 | MW37 | MW03 | OU6-EB01 | OU6-EB02 | OU6-TB01 |
| | | | | Lab SDG | 1215007 | 1215007 | 1215007 | 1215046 | 1215007 | 1215046 |
| | | | | Collection Date | 8/6/2021 10:45:00 AM | 8/6/2021 1:10:00 PM | 8/6/2021 2:25:00 PM | 8/5/2021 5:00:00 PM | 8/6/2021 5:30:00 PM | 8/4/2021 8:00:00 AM |
| | | | | Matrix | Groundwater | Groundwater | Groundwater | Water QC | Water QC | Water QC |
| | | | | QC Type | Primary | Primary | Primary | Equipment Blank | Equipment Blank | Trip Blank |
| Method | Analyte1 | 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 |
| AK102 | **Diesel Range Organics** | 1500 | NE | µg/L | ND [306] | 236 [300] J,B | 276 [283] J,B | -- | 329 [294] J | -- |
| AK103 | **Residual Range Organics** | 1100 | NE | µg/L | 325 [255] J,B | ND [250] | 281 [236] J,B | -- | 333 [245] J | -- |
| E300.0 | Sulfate | NE | NE | µg/L | 11100 [1000] | 12600 [1000] | 43800 [1000] | ND [100] | ND [100] | -- |
| SW6020B | Iron | NE | NE | µg/L | 2430 [250] | ND [250] | 13600 [250] | ND [250] | ND [250] | -- |
| SW6020B | Manganese | NE | NE | µg/L | 322 [1.00] | 111 [1.00] | 804 [1.00] | ND [1.00] | ND [1.00] | -- |
| SW8260D | 1,1-Dichloroethene | NE | 7 | µg/L | -- | -- | -- | ND [0.500] | -- | ND [0.500] |
| SW8260D | cis-1,2-Dichloroethene | NE | 70 | µg/L | -- | -- | -- | ND [0.500] | -- | ND [0.500] |
| SW8260D | Tetrachloroethene | NE | 5 | µg/L | -- | -- | -- | ND [0.500] | -- | ND [0.500] |
| SW8260D | trans-1,2-Dichloroethene | NE | 100 | µg/L | -- | -- | -- | ND [0.500] | -- | ND [0.500] |
| SW8260D | **Trichloroethene** | 5 | 5 | µg/L | -- | -- | -- | ND [0.500] | -- | ND [0.500] |
| SW8260D | Vinyl chloride | NE | 2 | µg/L | -- | -- | -- | ND [0.0750] | -- | ND [0.0750] |
| SW8260DSIM | **1,2,3-Trichloropropane** | 0.0075 | NE | µg/L | -- | -- | -- | ND [0.00500] | -- | ND [0.00500] |

**Notes:**

[1] **OU6 ROD analytes are identified in blue bold 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.**

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,
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

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| °C | degrees Celsius |
| % | percent |
| µg/L | micrograms per liter |
| AAC | Alaska Administrative Code |
| ADEC | Alaska Department of Environmental Conservation |
| Brice | Brice Engineering, LLC |
| CDQR | chemical data quality review |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CoC | chain-of-custody |
| DL | detection limit |
| DoD | Department of Defense |
| DQO | data quality objective |
| DRO | diesel range organics |
| EB | equipment blank |
| EPA | U.S. Environmental Protection Agency |
| FD | field duplicate |
| GC | gas chromatography |
| GC/MS | gas chromatography/mass spectrometry |
| GRO | gasoline range organics |
| LCL | lower control limit |
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| LOD | limit of detection |
| LOQ | limit of quantitation |
| MB | method blank |
| mg/L | milligrams per liter |
| MPC | measurement performance criteria |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| ND | non-detect |
| OU6 | Operable Unit 6 |
| QA | quality assurance |
| QC | quality control |
| QSM | Quality Systems Manual |
| RG | remedial goal(s) |
| ROD | Record of Decision |
| RPD | relative percent difference |
| RSD | relative standard deviation |
| SDG | sample delivery group |

# ACRONYMS AND ABBREVIATIONS (CONTINUED)

| | |
|---|---|
| SGS | SGS Environmental Services, Inc. |
| SOP | standard operating procedure |
| SVOC | semi-volatile organic compound |
| TB | trip blank |
| UCL | upper control limit |
| UFP-QAPP | Unified Federal Policy-Quality Assurance Project Plan |
| UST | underground storage tank |
| VOC | volatile organic compound |

# 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 Operable Unit 6 (OU6) Former Communications Site, located at Fort Wainwright, Alaska, during August 2021. These data have been reviewed to evaluate compliance with QA/QC criteria based on data quality objectives (DQOs) specified in the approved *Final 2021 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan Operable Units 1 Through 6* (Brice Engineering [Brice] 2021), hereafter referred to as the Work Plan, and *Final Postwide Uniform Federal Policy for Quality Assurance Project Plan* (UFP-QAPP), hereafter referred to as the QAPP (Brice 2020).

The associated Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklist is 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

All samples were shipped to SGS Environmental Services, Inc. (SGS) of Anchorage, Alaska, which was identified in the Work Plan (Brice 2021) as the backup laboratory for the project. Agriculture & Priority Pollutants Laboratories (APPL) of Clovis, California was identified as the primary laboratory; however, it was decided to not ship APPL any OU6 samples due to overall poor performance and substantial quality control issues observed for a different Brice project right around the time the OU6 field activities were being planned. SGS holds current ADEC laboratory approval and 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 (USTs) 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 Checklist 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 the OU6 Record of Decision (ROD) remedial goals (RGs) and EPA maximum contaminant levels (MCLs) for the purpose of this review. The screening levels used for each analyte are presented along with analytical results in the results tables (Appendix A).

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 (DoD 2019a); DoD 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 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), equipment blanks (EBs), and field duplicates (FDs)
- Laboratory reporting limits, including limits of detection (LODs) and limits of quantitation (LOQs)
- Method blanks (MBs)
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) recoveries
- Surrogate spike recoveries
- Matrix spike (MS) and matrix spike duplicate (MSD) recoveries
- Initial and continuing calibration summary information
- Internal standards performance (gas chromatography/mass spectrometry [GC/MS])
- Precision, including relative percent difference (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) defined in the Work Plan. The following MPC were used for this data quality review and assessment:

- *Precision* is a measure of the reproducibility of measurements, which can be used to verify laboratory procedures, determine matrix effect, or sample homogeneity. Precision was measured by the RPD between LCS and LCSDs, MS and MSDs, or primary and FD results.
- *Accuracy* is a measure of the correctness or closeness to the true value. Accuracy was evaluated by reviewing the following elements: calibrations, surrogates, LCS, LCSD, MS, MSD, MBs, relative response factors and relative standard deviations (RSD), tune criteria, second column confirmations, and internal standards.
- *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, and using standard and comprehensive reporting formats.
- *Sensitivity* is a measure of 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 OU6 ROD RGs and EPA MCLs to determine whether the analytical methods and/or laboratory procedures were able to meet the project DQOs.

The qualifiers listed in Table B-1 were applied to the analytical data set, as appropriate.

**Table B-1 Data Qualifiers**

| QUALIFIER | DESCRIPTION |
|---|---|
| ND [LOD] | Analyte is not detected above the DL [LOD is presented in brackets]. |
| J | The reported result was an estimated value with an unknown bias. |
| J+ | The result was an estimated quantity, but the result may be biased high. |
| J- | The result was an estimated quantity, but the result may be biased low. |
| B | Analyte result is considered a high estimated value due to contamination present in an associated blank (e.g., MB or TB). |
| 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, refer to the Acronyms and Abbreviations section.

Qualification was not required in the following circumstances:

- Surrogate or MS recoveries were 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 (per compound) criteria not met
- Continuing calibration (per compound) 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 not discussed in this report and are addressed in the associated ADEC Laboratory Data Review Checklists (Attachment B-1).

# 3.0 CHEMICAL DATA QUALITY REVIEW

The data verification and CDQR were performed to assess the overall quality and usability of the data collected to support sampling activities at OU6.

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. 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 vs 5.3 criteria except where noted. A complete summary of qualified results is presented in Table B-3, located at the end of this report.

## 3.1 Analytical Sample and Field Quality Control Sample Summary

A total of 18 primary groundwater samples, two FD groundwater samples, two EBs, and one TB were collected and analyzed in support of project activities. The sample summary table in Appendix A includes all field samples submitted to the analytical laboratory.

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). EBs were collected and submitted to the laboratory at the project required frequency of 5% for non-dedicated sampling equipment. A TB was included in the cooler containing samples for volatile analyses (SW8260D and SW8260D selected ion monitoring (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 2021), 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. Petroleum odor and was observed on purge water from wells MW06A, MW33, and MW77.
- All wells were found screened across the water table during purging and sampling activities, with three exceptions: MW78, MW91, and MW80. 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 intentionally screened below the water table to evaluate the vertical extent of contamination.

- Persistent air bubbles were noted in purge water inside the tubing and flow-through cell on well MW58.

## 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 are included in the final laboratory report. 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. Groundwater samples were hand-delivered to SGS in Fairbanks, Alaska for transfer to their Anchorage laboratory via Lynden Transport. All sample coolers were received with temperature blank and ambient cooler temperatures between 0 and 6°C.

No discrepancies were noted upon receipt of samples at the laboratory.

## 3.4 Sample Preservation and Holding Time Compliance

All samples were 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

To determine whether the laboratory data met measurement performance criteria (MPC) for sensitivity, sample LODs for non-detects were compared to OU6 ROD RGs, and the LODs for non-detect non-ROD analytes were compared to the EPA MCLs. All analytes had LODs for non-detect results that met the MPC for sensitivity.

## 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 samples where non-dedicated sampling equipment is used.

### 3.6.1 Method Blanks

A MB was included with each preparatory batch of 20 or fewer samples, as required. No target analytes were detected in the MBs associated with this project.

### 3.6.2 Trip Blanks

A TB was included with each cooler containing volatile samples, as required. No target analytes were detected in the TBs associated with this project.

### 3.6.3 Equipment Blanks

EBs were collected at the required project frequency of 5% for groundwater samples collected using non-dedicated sampling equipment.

The following analytes were detected above the DL in the EBs and had associated project sample detections less than 10 times the blank concentration:

AK102 analyte diesel range organics (DRO) was detected in the EB for SDG 1215007 at a concentration greater than the LOD but less than the LOQ. The associated sample results for DRO were qualified B for potential high bias:

- DRO: 21FWOU605WG, 21FWOU608WG, 21FWOU609WG, 21FWOU616WG, 21FWOU619WG and 21FWOU620WG.

AK103 analyte residual range organics (RRO) was detected in the EB for SDG 1215007 at a concentration greater than the LOD but less than the LOQ. The associated sample results for RRO were qualified B for potential high bias:

- RRO: 21FWOU605WG, 21FWOU608WG, 21FWOU609WG, 21FWOU615WG, 21FWOU616WG, 21FWOU617WG, 21FWOU618WG, and 21FWOU620WG

Affected results were either significantly above or significantly below the OU6 ROD RGs so data usability was not affected, with the following exceptions:

- The DRO result in sample 21FWOU616WG was only slightly less than the RG and potentially biased high, so the data usability was not affected.
- The RRO result in sample 21FWOU615WG was only slightly less than the RG and potentially biased high, so the data usability was not affected.

Equipment blank 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 preparatory batch, as required. LCS and LCSD percent recovery and LCS/LCSD RPD were compared to the project MPC. All LCS/LCSD recoveries were within control limits and LCS/LCSD precision was within the RPD limit.

## 3.8 Matrix Spike Samples and Duplicates

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

- AK102/103 batch XXX45397 did not include an MS/MSD. This batch did include an LCS/LCSD, which met precision criteria.

- SW8260D-SIM batch VXX37653 did not include a MS/MSD. This batch did include an LCS/LCSD, which met precision criteria.

MS/MSD recoveries and MS/MSD RPD were compared to project MPCs and met acceptance criteria, with following exceptions:

AK102 analyte DRO was recovered less than the lower control limit (LCL) in the MS/MSD performed for project sample 21FWOU606WG. The sample results in project samples 21FWOU606WG and associated FD 21FWOU607WG for DRO were qualified J- for estimated potential low bias. The affected results were significantly greater than the OU6 ROD RGs so data usability was not affected.

SW6020B analyte iron was recovered greater than the upper control limit (UCL) in the MS/MSD performed for project sample 21FWOU612WG. The sample results in project samples 21FWOU612WG and associated FD 21FWOU613WG for iron were qualified J+ for estimated potential high bias. The affected results have no established screening level, so data usability was not affected.

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

## 3.9 Surrogates

Surrogates were included with all laboratory QC and field samples, as required. Surrogate recoveries were reviewed and compared to project MPC. All surrogate recoveries were within control limits for laboratory QC and field samples.

## 3.10 Field Duplicate Precision

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

Two FD samples were submitted and analyzed for 18 primary groundwater locations included in the OU6 monitoring event. FD pairs were analyzed for the following methods: AK102, AK103, E300.0, SW6020B, SW8260D, and SW8260D-SIM. The RPD for all pairs was less than the recommended 30% for water.

Table B-2, on the following page, summarizes the FD detections that were included in precision evaluations.

**Table B-2 Field Duplicate Precision Summary**

| SDG | METHOD | ANALYTE | PRIMARY SAMPLE | RESULT | UNITS | FIELD DUPLICATE | RESULT | UNITS | RPD | QUALIFIER |
|---|---|---|---|---|---|---|---|---|---|---|
| 1215007 | AK102 | DRO | 21FWOU606WG | 70,300 J- | µg/L | 21FWOU607WG | 58,900 J- | µg/L | 17.65% | -- |
| 1215007 | AK103 | RRO | 21FWOU606WG | 8,890 | µg/L | 21FWOU607WG | 8,160 | µg/L | 8.56% | -- |
| 1215007 | SW6020B | Iron | 21FWOU606WG | 55,100 | µg/L | 21FWOU607WG | 55,600 | µg/L | 0.90% | -- |
| 1215007 | SW6020B | Manganese | 21FWOU606WG | 4,470 | µg/L | 21FWOU607WG | 4,470 | µg/L | 0.00% | -- |
| 1215007 | E300.0 | Sulfate | 21FWOU606WG | 6,120 | µg/L | 21FWOU607WG | 6,120 | µg/L | 0.00% | -- |
| 1215046 | SW6020B | Iron | 21FWOU612WG | 9,010 J+ | µg/L | 21FWOU613WG | 9,000 J+ | µg/L | 0.11% | -- |
| 1215046 | SW6020B | Manganese | 21FWOU612WG | 1,570 | µg/L | 21FWOU613WG | 1,580 | µg/L | 0.63% | -- |
| 1215046 | SW8260D | trans-1,2-Dichloroethene | 21FWOU612WG | 7.13 | µg/L | 21FWOU613WG | 7.49 | µg/L | 4.92% | -- |
| 1215046 | SW8260D | cis-1,2-Dichloroethene | 21FWOU612WG | 7.48 | µg/L | 21FWOU613WG | 7.79 | µg/L | 4.06% | -- |
| 1215046 | SW8260D | Trichloroethene | 21FWOU612WG | 1.07 | µg/L | 21FWOU613WG | 1.09 | µg/L | 1.85% | -- |
| 1215046 | E300.0 | Sulfate | 21FWOU612WG | 41,000 | µg/L | 21FWOU613WG | 40,800 | µg/L | 0.49% | -- |

## 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. No additional QC items that required data qualification were identified.

# 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 DQOs.

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 AND USABILITY ASSESSMENT

In general, the overall quality of the project data was acceptable and completeness goals were met. 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.

The following QC issues required qualification:

- EB contamination
- MS/MSD recovery failures

Table B-3 includes all qualified results and reasons for qualification.

# 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.

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

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

ADEC. 2021. 18 Alaska Administrative Code (AAC) 75, *Oil and Other Hazardous Substances Pollution Control.* June.

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

Brice. 2021. *Final 2021 CERCLA Site Work Plan Operable Units 1 through 6 – Fort Wainwright, Alaska*. July.

Department of Defense (DoD). 2019a. *Quality Systems Manual for Environmental Laboratories, Version 5.3.* May.

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

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).*

**Table B-3 Qualified Results Summary**

| LOCATION ID | SAMPLE ID | METHOD | ANALYTE | RESULT (µg/L) | QUAL | REASON FOR QUALIFICATION |
|---|---|---|---|---|---|---|
| **SDG 1215007** | | | | | | |
| MW58 | 21FWOU605WG | AK102 | Diesel Range Organics | 3.21 [0.294] | B | EB<RL |
| MW58 | 21FWOU605WG | AK103 | Residual Range Organics | 0.710 [0.245] | B | EB<RL |
| MW33 | 21FWOU606WG | AK102 | Diesel Range Organics | 70.3 [0.294] | J- | MS<LCL, MSD<LCL |
| AP-1010 | 21FWOU607WG | AK102 | Diesel Range Organics | 58.9 [0.300] | J- | MS<LCL, MSD<LCL |
| MW62 | 21FWOU608WG | AK103 | Residual Range Organics | 0.791 [0.250] | B | EB<RL |
| MW12R | 21FWOU609WG | AK103 | Residual Range Organics | 0.549 [0.245] | B | EB<RL |
| MW62 | 21FWOU608WG | AK102 | Diesel Range Organics | 0.429 [0.300] | J,B | EB<RL |
| MW12R | 21FWOU609WG | AK102 | Diesel Range Organics | 0.542 [0.294] | J,B | EB<RL |
| MW77 | 21FWOU616WG | AK102 | Diesel Range Organics | 1.38 [0.300] | B | EB<RL |
| MW06A | 21FWOU615WG | AK103 | Residual Range Organics | 1.08 [0.245] | B | EB<RL |
| MW37 | 21FWOU619WG | AK102 | Diesel Range Organics | 0.236 [0.300] | J,B | EB<RL |
| MW77 | 21FWOU616WG | AK103 | Residual Range Organics | 0.696 [0.250] | B | EB<RL |
| MW82 | 21FWOU617WG | AK103 | Residual Range Organics | 0.367 [0.250] | J,B | EB<RL |
| MW03 | 21FWOU620WG | AK102 | Diesel Range Organics | 0.276 [0.283] | J,B | EB<RL |
| MW64 | 21FWOU618WG | AK103 | Residual Range Organics | 0.325 [0.255] | J,B | EB<RL |
| MW03 | 21FWOU620WG | AK103 | Residual Range Organics | 0.281 [0.236] | J,B | EB<RL |
| **SDG 1215046** | | | | | | |
| MW61 | 21FWOU612WG | SW6020B | Iron | 9010 [250] | J+ | MS>UCL, MSD>UCL |
| AP-2020 | 21FWOU613WG | SW6020B | Iron | 9000 [250] | J+ | MS>UCL, MSD>UCL |

**Notes:**

For definitions, refer to the Acronyms and Abbreviations section.

B – Result is biased high due to contamination present in the equipment blank, method blank, or trip blank

EB<RL – Equipment blank concentration less than the reporting limit

J/J-/J+ – 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. When possible, direction of bias indicated.

MS<LCL – Matrix spike recovery less than the lower control limit

MS>UCL – Matrix spike recovery greater than the upper control limit

MSD<LCL – Matrix spike duplicate recovery less than the lower control limit

MSD>UCL – Matrix spike duplicate recovery greater than the upper control limit

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# ATTACHMENT B-1
# ADEC LABORATORY DATA REVIEW CHECKLISTS

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# Laboratory Data Review Checklist

Completed By:

Travis Gouveia

Title:

Project Chemist

Date:

October 14, 2021

Consultant Firm:

Brice Engineering

Laboratory Name:

SGS Environmental Services of Anchorage, AK

Laboratory Report Number:

1215007

Laboratory Report Date:

September 10, 2021

CS Site Name:

OU 6 – Former Communications Site – Fort Wainwright, AK

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

1215007

Laboratory Report Date:

September 10, 2021

CS Site Name:

OU 6 – Former Communications Site – 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:

Samples were received and analyzed by SGS of Anchorage, AK. CS Approval 17-021

   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:

All analyses performed at SGS.

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:

Cooler Brice05 was received at 1.5°C.

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

   Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☐ N/A☒ Comments:

No discrepancies were noted.

e. Data quality or usability affected?

Comments:

N/A – no discrepancies

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:

QC failures are identified in the case narrative and discussed in the applicable section of this checklist.

c. Were all corrective actions documented?

Yes☒ No☐ N/A☐ Comments:

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

Comments:

Effects on data quality and usability are discussed in the applicable sections of this checklist.

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5. Samples Results

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

Yes☒ No☐ N/A☐ Comments:

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 soil samples included with 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 OU6 ROD RGs, and all LODs for non-detect results met MPC for sensitivity.

e. Data quality or usability affected?

No impact to data quality or usability.

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:

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

Comments:

N/A – no analytes were detected in the method blanks

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

Yes☐ No☐ N/A☒ Comments:

N/A – no analytes were detected in the method blanks

v. Data quality or usability affected?

Comments:

Usability is not affected as no data were qualified.

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:

- SW6020B: Analytical batch MXX34532 did not have a LCSD, however the lab analyzed a site-specific MS/MSD in order to meet batch QC criteria.
- E300.0: Analytical batch WXX13886 did not include a sample duplicate but is not required by the method. This batch did have a site-specific MS/MSD analyzed.
- E300.0: Analytical batch WXX13888 did not include a sample duplicate but is not required by the method.

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:

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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:

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

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

Comments:

Usability is not affected as no data were qualified.

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:

- AK102/103: Analytical batch XXX45397 did not contain a MS/MSD. This batch included an LCS/LCSD.

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

Yes☐ No☐ N/A☒ Comments:

- E300.0: Analytical batch WXX13888 did not include a MSD but is not required by the method.

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

Yes☐ No☐ N/A☒ Comments:

- SW6020B: Iron was recovered (229%/313%) greater than upper control limit (UCL) of 118% in the MS and MSD performed on sample 21FWOU606WG. However, the native iron concentration in the parent sample was significantly greater than the spike concentration. No flags were applied to the data due to the high recoveries.
- SW6020B: Manganese was recovered outside of control limits in the MS and MSD performed on sample 21FWOU606WG. However, the native manganese concentration in the parent sample was significantly greater than the spike concentration. No flags were applied to the data due to the recoveries outside of control limits.
- AK102: Diesel range organics (DRO) was recovered (27%/64%) less than the lower control limit (LCL) of 75% in the MS and MSD performed on sample 21FWOU606WG. The associated DRO result in sample 21FWOU606WG and the field duplicate (FD) 21FWOU607WG were flagged J- due to possible low bias.

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:

- AK102: 21FWOU606WG and the associated FD 21FWOU607WG

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

Yes☒ No☐ N/A☐ Comments:

- The DRO results in samples 21FWOU606WG and FD 21FWOU607WG were flagged J- due to possible low bias.

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

Comments:

The affected results are significantly greater than the RGs in the ROD, data usability was 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:

N/A – no surrogates were recovered outside of control limits

iv. Data quality or usability affected?

Comments:

Usability is not affected as no data were qualified.

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 were 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:

No volatile analyses were included with this SDG.

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

Yes☐ No☐ N/A☒ Comments:

No volatile analyses were included with this SDG.

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

Comments:

N/A - No volatile analyses were included with this SDG.

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 FD pair, 21FWOU606WG/21FWOU607WG was submitted for ten primary field samples for AK102/103, SW6020B, and E300.0

ii. Submitted blind to lab?

Yes☒ No☐ N/A☐ Comments:

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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 21FWOU606WG/21FWOU607WG was submitted and analyzed for AK102/103, E300.0, and SW6020B.

| SPM_MethodID | ClientAnalyteName | PR | DUP | RPD |
|---|---|---|---|---|
| AK102 | Diesel Range Organics (C10-C25) | 70.3 | 58.9 | 17.65% |
| AK103 | Residual Range Organics (C25-C36) | 8.89 | 8.16 | 8.56% |
| 6020B | Iron | 55.1 | 55.6 | 0.90% |
| 6020B | Manganese | 4.47 | 4.47 | 0.00% |
| 300.0 | Sulfate | 6.12 | 6.12 | 0.00% |

All RPDs in N/FD pair 21FWOU606WG/21FWOU607WG were within the recommended limit of 30% RPD for water samples.

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

Comments:

Usability is not affected as no data were qualified.

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☒ N/A☐ Comments:

- AK102: DRO was detected in EB greater than the LOD but less than the LOQ in the equipment blank (EB) 21FWOU6EB02.
- AK103: RRO was detected in EB greater than the LOD but less than the LOQ in the EB 21FWOU6EB02.

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

Comments:

- AK102: The DRO results in samples 21FWOU605WG, 21FWOU608WG, 21FWOU609WG, 21FWOU616WG, 21FWOU619WG, and 21FWOU620WG were less than 10x the EB concentration and were flagged B for potential high bias.
- AK103: The RRO results in samples 21FWOU605WG, 21FWOU608WG, 21FWOU609WG, 21FWOU615WG, 21FWOU616WG, 21FWOU617WG, 21FWOU618WG, and 21FWOU620WG were less than 10x the EB concentration and were flagged B for potential high bias.

iii. Data quality or usability affected?

Comments:

Affected results were either significantly above or significantly below the ROD RGs so data usability was not affected, with the following exceptions:

- The DRO result in sample 21FWOU616WG was only slightly less than the RG and potentially biased high, so the data usability was not affected.
- The RRO result in sample 21FWOU615WG was only slightly less than the RG and potentially biased high, so the data usability was 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:

Travis Gouveia

Title:

Project Chemist

Date:

October 18, 2021

Consultant Firm:

Brice Engineering

Laboratory Name:

SGS Environmental Services of Anchorage, AK

Laboratory Report Number:

1215046

Laboratory Report Date:

September 09, 2021

CS Site Name:

OU 6 – Former Communications Site – Fort Wainwright, AK

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

1215046

Laboratory Report Date:

September 09, 2021

CS Site Name:

OU 6 – Former Communications Site – 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:

Samples were received and analyzed by SGS of Anchorage, AK. CS Approval 17-021

   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:

All analyses performed at SGS.

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:

Cooler 080901 was received at 1.1°C.

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

   Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☐ N/A☒ Comments:

No discrepancies were noted.

e. Data quality or usability affected?

Comments:

N/A – no discrepancies

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:

QC failures are identified in the case narrative and discussed in the applicable section of this checklist.

c. Were all corrective actions documented?

Yes☒ No☐ N/A☐ Comments:

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

Comments:

Effects on data quality and usability are discussed in the applicable sections of this checklist.

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Laboratory Report Date:

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CS Site Name:

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5. Samples Results

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

Yes☒ No☐ N/A☐ Comments:

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 soil samples included with 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 OU6 ROD RGs, and all LODs for non-detect results met MPC for sensitivity.

e. Data quality or usability affected?

No impact to data quality or usability.

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:

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

Comments:

N/A – no analytes were detected in the method blanks

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

Yes☐ No☐ N/A☒ Comments:

N/A – no analytes were detected in the method blanks

v. Data quality or usability affected?

Comments:

Usability is not affected as no data were qualified.

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:

- SW6020B: Analytical batch MXX34535 did not have a LCSD, however the lab analyzed a site-specific MS/MSD in order to meet batch QC criteria.
- E300.0: Analytical batch WXX13897 did not include a sample duplicate but is not required by the method. This batch did have a site-specific MS/MSD analyzed.

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:

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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:

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

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

Comments:

Usability is not affected as no data were qualified.

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:

- SW8260D-SIM: Batch VXX37653 did not contain a MS/MSD, but did contain a LCS/LCSD.

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☐ N/A☒ Comments:

- SW6020B: Batch MXX34535 had two MS/MSDs performed. Manganese was recovered less than the lower control limit (LCL) in the MSD performed on a sample that was not a project sample. No flags were applied to the data since the parent sample was not a project sample.
- SW6020B: Iron was recovered (132%/132%) greater than upper control limit (UCL) of 118% in the MS and MSD performed on parent sample 21FWOU612WG. The associated iron results in samples 21FWOU612WG and the field duplicate (FD) 21FWOU613WG were flagged J+ due to possible high bias.

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:

- SW6020B: 21FWOU612WG and FD 21FWOU613WG

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

Yes☒ No☐ N/A☐ Comments:

- The iron results in samples 21FWOU612WG and FD 21FWOU613WG DRO were flagged J+ due to possible high bias.

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

Comments:

The affected iron results have no established screening criteria, so data usability was 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:

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Laboratory Report Date:

September 09, 2021

CS Site Name:

OU 6 – Former Communications Site – Fort Wainwright, AK

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:

N/A – no surrogates were recovered outside of control limits

iv. Data quality or usability affected?

Comments:

Usability is not affected as no data were qualified.

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:

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:

N/A – there were no detections in the TB.

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Laboratory Report Date:

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CS Site Name:

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v. Data quality or usability affected?

Comments:

Usability is not affected as no data were qualified.

f. Field Duplicate

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

Yes☒ No☐ N/A☐ Comments:

One FD pair, 21FWOU612WG/21FWOU613WG was submitted for eight primary field samples for SW6020B, SW8260D, SW8260D-SIM, and E300.0.

ii. Submitted blind to lab?

Yes☒ No☐ N/A☐ Comments:

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Laboratory Report Date:

September 09, 2021

CS Site Name:

OU 6 – Former Communications Site – 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 21FWOU612WG/21FWOU613WG was submitted and analyzed for SW6020B, SW8260D, SW8260D-SIM, and E300.0.

| ADEC_06E3_FieldDup | | | | | |
|---|---|---|---|---|---|
| SPM_MethodID | ClientAnalyteName | PAL | PR | DU | RPD |
| 8260D | trans-1,2-Dichloroethene | | 0.00713 | 0.00749 | 4.92% |
| 8260D | cis-1,2-Dichloroethene | | 0.00748 | 0.00779 | 4.06% |
| 8260D | Trichloroethene (TCE) | | 0.00107 | 0.00109 | 1.85% |
| 6020B | Manganese | | 1.57 | 1.58 | 0.63% |
| 300.0 | Sulfate | | 41 | 40.8 | 0.49% |
| 6020B | Iron | | 9.01 | 9 | 0.11% |

All RPDs in N/FD pair 21FWOU612WG/21FWOU613WG were within the recommended limit of 30% RPD for water samples.

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

Comments:

Usability is not affected as no data were qualified.

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Comments:

N/A – there were no detections in the EB.

iii. Data quality or usability affected?

Comments:

Usability is not affected as no data were qualified.

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 2021 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 | 21FWOU620WG | 8/6/2021 | 1425 | 15.45 | Y | 0.00 | 7.70 | 0.624 | 0.24 | 7.04 | -109.20 | 9.12 | Y |
| MW06A | 21FWOU615WG | 8/6/2021 | 1015 | 15.93 | Y | 0.00 | 6.80 | 0.620 | 0.16 | 6.83 | -118.2 | 1.28 | Y |
| MW08 | 21FWOU614WG | 8/5/2021 | 1535 | 18.04 | Y | 0.00 | 4.70 | 0.711 | 2.69 | 6.74 | 71.70 | 0.14 | Y |
| MW12R | 21FWOU609WG | 8/5/2021 | 1525 | 12.70 | Y | 0.00 | 8.10 | 0.461 | 0.01 | 7.04 | -132.20 | 0.40 | Y |
| MW13 | 21FWOU610WG | 8/5/2021 | 1055 | 16.14 | Y | 0.00 | 5.50 | 0.867 | 0.67 | 6.67 | 22.90 | 1.57 | Y |
| MW33 | 21FWOU606WG | 8/5/2021 | 1230 | 15.75 | Y | 0.00 | 6.70 | 1.033 | 0.33 | 6.86 | -133.30 | 12.30 | Y |
| MW37 | 21FWOU619WG | 8/6/2021 | 1310 | 15.55 | Y | 0.00 | 12.80 | 0.642 | 0.92 | 7.01 | 117.70 | 1.12 | Y |
| MW47 | 21FWOU603WG | 8/4/2021 | 1655 | 16.04 | Y | 0.00 | 6.90 | 0.656 | 1.62 | 7.06 | 39.00 | 0.39 | Y |
| MW58 | 21FWOU605WG | 8/5/2021 | 1110 | 13.22 | Y | 0.00 | 7.60 | 0.585 | 9.42 | 7.09 | -106.90 | 22.97 | Y |
| MW61 | 21FWOU612WG | 8/5/2021 | 1350 | 14.87 | Y | 0.00 | 6.40 | 0.637 | 0.28 | 7.04 | -106.40 | 4.17 | Y |
| MW62 | 21FWOU608WG | 8/5/2021 | 1415 | 14.09 | Y | 0.00 | 7.70 | 1.361 | 8.24 | 6.73 | 83.90 | 0.25 | Y |
| MW64 | 21FWOU618WG | 8/6/2021 | 1045 | 14.75 | Y | 0.00 | 7.40 | 0.547 | 0.20 | 7.19 | -71.3 | 5.92 | Y |
| MW77 | 21FWOU616WG | 8/6/2021 | 1125 | 18.08 | Y | 0.00 | 6.70 | 0.922 | 0.23 | 6.77 | 119.40 | 0.01 | Y |
| MW78 | 21FWOU601WG | 8/4/2021 | 1345 | 16.64 | N[4] | 0.00 | 7.40 | 0.531 | 0.12 | 7.25 | -115.50 | 7.98 | Y |
| MW79 | 21FWOU604WG | 8/4/2021 | 1820 | 18.12 | Y | 0.00 | 7.70 | 0.646 | 0.45 | 7.06 | -68.60 | 4.83 | Y |
| MW80 | 21FWOU611WG | 8/5/2021 | 1240 | 14.36 | N[4] | 0.00 | 6.00 | 0.431 | 0.07 | 7.22 | -130.1 | 1.76 | Y |
| MW82 | 21FWOU617WG | 8/6/2021 | 1245 | 17.58 | Y | 0.00 | 7.50 | 0.998 | 10.90 | 6.78 | 139.6 | 0.02 | Y |
| MW91 | 21FWOU602WG | 8/4/2021 | 1510 | 16.81 | N[4] | 0.00 | 8.20 | 0.423 | 0.11 | 7.43 | -137.50 | 10.52 | 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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# 2021 FIELD FORMS

# OU6

## U.S. Army Garrison Alaska


**Contract No. W911KB-17-D-0020**

**Task Order W911KB-20F-0053**

ANC 8(a)
Brice
ENGINEERING

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/4/21
SAMPLE ID: 21FWOU6 01 WG
TIME: 1345
LOCATION ID: AAW 78
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP:
LABORATORY ANALYSIS (circle): ~~VOC~~ VOC-LL, ~~DRO/RRO, Dissolved Fe/Mn, Sulfate~~
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 1 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):
TOTAL DEPTH (FT BTOC): 37.01
DEPTH TO WATER (FT BTOC): - 16.64
WATER COLUMN HEIGHT (FT): = 20.37
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)]: 3.3
SCREEN LENGTH (FT): 10'
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / (Above Screen)
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 28
* 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.

ADDITIONAL NOTES:

**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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.4 | 0.524 | 0.61 | 7.19 | -84.3 | 91.98 | 16.69 |
| 10 | 1.3 | 7.3 | 0.529 | 0.35 | 7.21 | -98.6 | 55.26 | 16.69 |
| 15 | 1.95 | 7.2 | 0.531 | 0.21 | 7.22 | -107.6 | 45.25 | 16.69 |
| 20 | 2.6 | 7.4 | 0.532 | 0.16 | 7.23 | -111.3 | 26.39 | 16.69 |
| 25 | 3.25 | 7.3 | 0.531 | 0.14 | 7.23 | -113.0 | 14.68 | 16.69 |
| 30 | 3.9 | 7.5 | 0.531 | 0.13 | 7.24 | -113.7 | 12.41 | 16.69 |
| 35 | 4.55 | 7.5 | 0.531 | 0.12 | 7.25 | -115.0 | 8.38 | 16.69 |
| 40 | 5.2 | 7.4 | 0.530 | 0.12 | 7.25 | -115.2 | 7.50 | 16.69 |
| 45 | 5.85 | 7.4 | 0.531 | 0.12 | 7.25 | -115.5 | 7.98 | 16.69 |
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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 (gal): 6 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: CD804DU6CB01 IBC (15gal poly)
DISPOSAL TYPE: CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/4/21
SAMPLE ID: 21FWOU6 02 WG
TIME: 1510
LOCATION ID: MW91
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP:
LABORATORY ANALYSIS (circle): ~~VOC~~ VOC-LL, ~~DRO/RRO, Dissolved Fe/Mn, Sulfate~~
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 1 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):
TOTAL DEPTH (FT BTOC): 75.94
DEPTH TO WATER (FT BTOC): - 16.81
WATER COLUMN HEIGHT (FT): = 59.13
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)]: 9.6
SCREEN LENGTH (FT): 20
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 56.9
* 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.
ADDITIONAL NOTES:

**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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 9.4 | 0.420 | 0.32 | 7.41 | -139.8 | 22.65 | 16.83 |
| 10 | 1.4 | 8.3 | 0.424 | 0.23 | 7.40 | -138.6 | 20.05 | 16.83 |
| 15 | 2.1 | 8.3 | 0.424 | 0.15 | 7.40 | -138.0 | 18.05 | 16.83 |
| 20 | 2.8 | 9.4 | 0.420 | 0.16 | 7.40 | -139.5 | 17.72 | 16.83 |
| 25 | 3.5 | 8.9 | 0.422 | 0.13 | 7.39 | -137.2 | 12.96 | 16.83 |
| 30 | 4.2 | 8.0 | 0.422 | 0.12 | 7.40 | -135.9 | 13.28 | 16.83 |
| 35 | 4.9 | 8.2 | 0.423 | 0.11 | 7.42 | -137.7 | 10.96 | 16.83 |
| 40 | 5.6 | 8.2 | 0.423 | 0.11 | 7.43 | -137.5 | 10.52 | 16.83 |
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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 (gal): 7 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: C0804 0006 CB01 IBC / 15gal poly
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/4/21
SAMPLE ID: 21FWOU6 03 WG
TIME: 1655
LOCATION ID: MW47
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP: SUNNY / 81°F
LABORATORY ANALYSIS (circle): ~~VOC~~ VOC-SL, DRO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable) (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 #: 1 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): 19.67
DEPTH TO WATER (FT BTOC): - 16.04
WATER COLUMN HEIGHT (FT): = 3.63
SCREEN LENGTH (FT): 10
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 17
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)]: 0.6
* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.8 | 0.655 | 3.10 | 7.04 | 49.6 | 2.60 | 16.07 |
| 10 | 1.3 | 7.5 | 0.654 | 2.69 | 7.04 | 45.0 | 2.73 | 16.07 |
| 15 | 1.95 | 7.0 | 0.653 | 2.48 | 7.04 | 43.4 | 1.21 | 16.07 |
| 20 | 2.6 | 7.5 | 0.649 | 2.23 | 7.05 | 41.0 | 1.56 | 16.07 |
| 25 | 3.25 | 7.4 | 0.645 | 1.98 | 7.05 | 39.3 | 1.11 | 16.07 |
| 30 | 3.9 | 7.2 | 0.654 | 1.92 | 7.05 | 38.0 | 0.52 | 16.07 |
| 35 | 4.55 | 7.1 | 0.657 | 1.87 | 7.05 | 37.8 | 0.42 | 16.07 |
| 40 | 5.2 | 7.0 | 0.655 | 1.70 | 7.05 | 37.6 | 0.59 | 16.07 |
| 45 | 5.85 | 7.0 | 0.655 | 1.65 | 7.06 | 37.9 | 0.18 | 16.07 |
| 50 | 6.5 | 6.9 | 0.656 | 1.62 | 7.06 | 39.0 | 0.39 | 16.07 |
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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 (gal): 7 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: C0804006CB02 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: (Y) / N

CB

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/4/21
SAMPLE ID: 21FWOU6 04 WG
TIME: 1820
LOCATION ID: MW 79
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP:
LABORATORY ANALYSIS (circle): ~~VOC~~ VOC-LL, ~~DRO/RRO~~, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 1 Turbidity Meter #: 11 Water Level: 16
WELL COMPLETION (circle): (Stick-up) / Flushmount
ADDITIONAL NOTES: INITIAL 0.25 GALLONS
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): 21.52
SCREEN LENGTH (FT): 10
DEPTH TO WATER (FT BTOC): - 18.12
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
WATER COLUMN HEIGHT (FT): = 3.43
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 19.1
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)]: 0.56
* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 8.1 | 0.650 | 2.79 | 7.03 | -58.8 | 8.29 | 18.16 |
| 10 | 1.3 | 7.8 | 0.651 | 0.56 | 7.02 | -57.8 | 5.00 | 18.16 |
| 15 | 1.95 | 7.7 | 0.649 | 0.50 | 7.05 | -62.9 | 4.76 | 18.16 |
| 20 | 2.6 | 7.8 | 0.647 | 0.48 | 7.05 | -66.3 | 4.59 | 18.16 |
| 25 | 3.25 | 7.7 | 0.646 | 0.45 | 7.06 | -68.6 | 4.83 | 18.16 |
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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 (gal): 5.5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: C080400V6CB02 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: (Y) / N

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (If applicable): Former Communications Site (FCS)
DATE: 8/5/21
SAMPLE ID: 21FWOU6 05 WG
TIME: 1110
LOCATION ID: MW58
SAMPLER: JB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP: Sunny 71°F
LABORATORY ANALYSIS (circle): ~~VOC, VOC-LL~~, DRO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable) (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 #: 3 Turbidity Meter #: 13 Water Level: 17
WELL COMPLETION (circle): Stick-up / (Flushmount)
WELL CONDITION: Plug: (Y) N Lock: (Y) N Labeled: (Y) N Well Damage: Y (N)
ADDITIONAL NOTES: Trouble putting tube back in around b/c pump fits just fine
FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):
TOTAL DEPTH (FT BTOC): 18.22
SCREEN LENGTH (FT): 8.2 – 18.2
DEPTH TO WATER (FT BTOC): - 13.22
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
WATER COLUMN HEIGHT (FT): = 5
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 14.2
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)]: 0.815
* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.8 | 0.569 | 7.30 | 7.04 | -99.6 | 199.7 | 13.30 |
| 10 | 1.0 | 8.5 | 0.574 | 8.45 | 7.06 | -105.1 | 112.6 | 13.35 |
| 15 | 1.5 | 7.8 | 0.582 | 10.55 | 7.07 | -106.4 | 49.73 | 13.30 |
| 20 | 2.0 | 7.5 | 0.582 | 10.14 | 7.07 | -106.8 | 30.86 | 13.32 |
| 25 | 2.5 | 7.6 | 0.584 | 9.45 | 7.07 | -105.4 | 31.10 | 13.33 |
| 30 | 3.0 | 7.6 | 0.585 | 9.42 | 7.09 | -106.9 | 22.97 | 13.32 |
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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: Brown stain on tube. Lots of bubbles - AS?

## IDW PURGE WATER MANAGEMENT

VOLUME GENERATED (gal): ~1 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: CD805OU6JS01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/5/21
SAMPLE ID: 21FWOU6 06 WG
TIME: 12:30
LOCATION ID: MW33
SAMPLER: SB
FD SAMPLE ID / LOC ID / TIME: 21FWOU607WG / AP-1010 / 12:45
WEATHER/TEMP: Sunny, 74°F
LABORATORY ANALYSIS (circle): ~~VOC, VOC-LL~~, ERO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? (Y) / N
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable) (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 #: 3 Turbidity Meter #: 13 Water Level: 17
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): 20.89
DEPTH TO WATER (FT BTOC): 15.75
WATER COLUMN HEIGHT (FT): = 5.14
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)]: 0.84
ADDITIONAL NOTES:
SCREEN LENGTH (FT): 10.8 - 20.8
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 16.8
* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 6.6 | 0.974 | 5.91 | 6.78 | -131.8 | 7.22 | 15.89 |
| 10 | 1.0 | 6.6 | 0.989 | 7.26 | 6.79 | -135.8 | 9.94 | 15.92 |
| 15 | 1.5 | 7.4 | 0.993 | 2.75 | 6.82 | -139.9 | 9.53 | 15.84 |
| 20 | 2.0 | 6.6 | 1.006 | 11.23 | 6.81 | -139.5 | 10.53 | 15.89 |
| 25 | 2.5 | 6.7 | 1.033 | 0.72 | 6.86 | -129.5 | 12.41 | 15.86 |
| 30 | 3.0 | 6.7 | 1.032 | 0.49 | 6.86 | -129.3 | 10.80 | 15.86 |
| 35 | 3.5 | 6.7 | 1.033 | 0.33 | 6.86 | -133.3 | 12.30 | 15.86 |
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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: Black Stain on tubing
POL odor
Extra purge water: Tube popped off

## IDW PURGE WATER MANAGEMENT

VOLUME GENERATED (gal): 5.5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: C08050UG2S01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/5/21
SAMPLE ID: 21FWOU6 07 WG
TIME: 1415
LOCATION ID: MW102
SAMPLER: DB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP: Sunny, 81°F
LABORATORY ANALYSIS (circle): ~~VOC, VOC-LL,~~ DRO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 3 Turbidity Meter #: 13 Water Level: 17
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): 20.11
SCREEN LENGTH (FT): 10.1 - 20.1
DEPTH TO WATER (FT BTOC): 14.09
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
WATER COLUMN HEIGHT (FT): = 6.02
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 13.09
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)]: 0.98
* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 6.7 | 1.372 | 0.14 | 6.69 | 95.2 | 7.00 | 14.18 |
| 10 | 1.0 | 7.7 | 1.364 | 3.28 | 6.71 | 90.5 | 5.08 | 14.16 |
| 15 | 1.5 | 7.8 | 1.361 | 8.22 | 6.73 | 85.3 | 2.98 | 14.15 |
| 20 | 2.0 | 7.7 | 1.361 | 8.23 | 6.74 | 84.6 | 1.09 | 14.18 |
| 25 | 2.5 | 7.7 | 1.361 | 8.24 | 6.73 | 83.9 | 0.25 | 14.18 |
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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 (gal): 5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: C0805006JS0 / IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: (Y) / N

# GROUNDWATER SAMPLING FORM

Bryce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (If applicable): Former Communications Site (FCS)
DATE: 8/5/21
SAMPLE ID: 21FWOU6 09 WG
TIME: 15:05
LOCATION ID: MW12R
SAMPLER: JS
FD SAMPLE ID / LOC ID / TIME: —
WEATHER/TEMP: Sunny 81°F
LABORATORY ANALYSIS (circle): ~~VOC, VOC-LL,~~ DRO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (If applicable): (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 #: 3 Turbidity Meter #: 13 Water Level: 17
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): 22.50
DEPTH TO WATER (FT BTOC): - 12.70
WATER COLUMN HEIGHT (FT): = 9.8
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)]: 1.59
ADDITIONAL NOTES:
SCREEN LENGTH (FT): 12.5 - 22.5
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 13.7
* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| TIME PURGED (min) | VOLUME PURGED (gal) | TEMPERATURE (°C) | CONDUCTIVITY (mS/cm) ±3% | DISSOLVED $O_2$ (mg/L) ±10% (<1mg/L, ±0.2 mg/L) | pH ±0.1 units | ORP (mV) ±10 mV | TURBIDITY (NTU) ±10% (<10NTU, ±1NTU) | WATER LEVEL (ft) |
| 5 | 0.5 | 8.6 | 0.4536 (✓) | 0.08 | 7.01 | -124.6 | 1.78 | 12.73 |
| 10 | 1.0 | 7.8 | 0.4599 | 0.01 | 7.03 | -127.7 | 1.39 | 12.73 |
| 15 | 1.5 | 8.1 | 0.4596 | 0.02 | 7.03 | -129.8 | 0.81 | 12.73 |
| 20 | 2.0 | 8.2 | 0.4600 | 0.02 | 7.04 | -132.2 | (✓) 0.91 | ↓ |
| 25 | 2.5 | 8.1 | 0.4609 | 0.01 | 7.04 | -132.2 | 0.40 | |

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 (gal): 3.5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: P0805DU6JS02 IBC / (5gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/5/21

SAMPLE ID: 21FWOU6 10 WG
TIME: 1055

LOCATION ID: MW13
SAMPLER: CB / TA

FD SAMPLE ID / LOC ID / TIME: —
WEATHER/TEMP: SUNNY / 70°F

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

VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable) (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 #: 1 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): —

TOTAL DEPTH (FT BTOC): 19.20
DEPTH TO WATER (FT BTOC): 16.14
WATER COLUMN HEIGHT (FT): = 3.06

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)]: 0.49

SCREEN LENGTH (FT): 10
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 17.1

* 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.

ADDITIONAL NOTES:

**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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 0.55 | 5.4 | 0.882 | 0.84 | 6.64 | 21.9 | 4.97 | 16.25 |
| 10 | 1.1 | 4.8 | 0.877 | 0.75 | 6.65 | 22.2 | 3.53 | 16.25 |
| 15 | 1.65 | 5.0 | 0.875 | 0.70 | 6.67 | 22.2 | 3.47 | 16.25 |
| 20 | 2.2 | 5.3 | 0.871 | 0.68 | 6.67 | 23.0 | 4.62 | 16.25 |
| 25 | 2.75 | 5.4 | 0.871 | 0.67 | 6.67 | 23.0 | 3.37 | 16.25 |
| 30 | 3.3 | 5.5 | 0.867 | 0.67 | 6.67 | 22.9 | 1.57 | 16.25 |
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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 (gal): 5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: C080500U6CB01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 08/05
SAMPLE ID: 21FWOU6 11 WG
TIME: 12:40
LOCATION ID: MW 80
SAMPLER: TA CB
FD SAMPLE ID / LOC ID / TIME: —
WEATHER/TEMP: 72 sunny
LABORATORY ANALYSIS (circle): VOC, ~~VOC-LL~~, ~~DRO/RRO~~, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 1 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): _____
TOTAL DEPTH (FT BTOC): 46.78 50Ft bottom
DEPTH TO WATER (FT BTOC): - 14.36
WATER COLUMN HEIGHT (FT): = 32.34
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)]: 5.28
SCREEN LENGTH (FT): 10
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / (Above Screen)
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 37.7
* 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.
ADDITIONAL NOTES:

**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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.1 | 4.226 | 0.20 | 7.20 | -114.9 | 38.06 | 14.40 |
| 10 | 1 | 6.3 | 0.430 | 0.14 | 7.21 | -122.8 | 24.7 | 14.42 |
| 15 | 1.5 | 5.7 | 0.4309 | 0.10 | 7.22 | -126.5 | 9.9 | 14.42 |
| 20 | 2.0 | 6.0 | 0.4312 | 0.09 | 7.22 | -127.7 | 5.56 | 14.42 |
| 25 | 2.5 | 6.1 | 0.4313 | 0.08 | 7.22 | -126.7 | 2.34 | 14.42 |
| 30 | 3.0 | 6.0 | 0.4313 | 0.07 | 7.22 | -130.1 | 1.76 | 14.42 |
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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 (gal): 7 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: C 0805 OU6 CB01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce Engineering

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS) MW61 — DATE: 08 05 21

SAMPLE ID: 21FWOU6 12 WG — TIME: 1350

LOCATION ID: MW61 — SAMPLER: CB/TA

FD SAMPLE ID / LOC ID / TIME: 21FWOU6 13 WG / MW AP2020 / 1405 — WEATHER/TEMP: 73 Sunny

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

VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): 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 #: 1 — 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):

TOTAL DEPTH (FT BTOC): 20.15

DEPTH TO WATER (FT BTOC): - 14.87

WATER COLUMN HEIGHT (FT): = 5.28

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)]: 0.86

SCREEN LENGTH (FT): 10

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

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 15.8

* 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.

ADDITIONAL NOTES:

**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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 6.7 | 0.638 | 1.18 | 6.99 | -93.8 | 27.56 | 15.1 |
| 10 | ~~0.14~~ 1.4 | 6.7 | 0.639 | 0.94 | 7.01 | -98.7 | 24.34 | 15.1 |
| 15 | ~~0.21~~ 2.1 | 6.5 | 0.635 | 0.80 | 7.02 | -100.8 | 15.28 | 15.1 |
| 20 | ~~0.28~~ 2.8 | 6.7 | 0.638 | 0.61 | 7.03 | -102.9 | 28.97 | 15.1 |
| 25 | 3.5 | 6.7 | 0.638 | 0.48 | 7.03 | -104.0 | 6.0 | 15.1 |
| 30 | 4.2 | 6.2 | 0.637 | 0.39 | 7.03 | -104.4 | 3.56 | 15.1 |
| 35 | 4.9 | 6.2 | 0.638 | 0.32 | 7.04 | -105.0 | 2.4 | 15.14 |
| 40 | 5.6 | 6.4 | 0.637 | 0.28 | 7.04 | -106.4 | 4.17 | 15.1 |
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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 (gal): 11 — CONTAINERIZED AND DISPOSED OF AS IDW? Y / N — IDW CONTAINER ID: C0805OU6CB02 — IBC / 15gal poly

DISPOSAL TYPE: CERCLA Waste — * Purge water stored in the DERA Building for characterization prior to disposal

PHOTOS TAKEN: Y / N

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
SAMPLE ID: 21FWOU6 14 WG
LOCATION ID: MW08
FD SAMPLE ID / LOC ID / TIME:
LABORATORY ANALYSIS (circle): ~~VOC~~, ~~VOC-LL~~, DRO/RRO, Dissolved Fe/Mn, Sulfate
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable) (Y) / N

DATE: 8/5/21
TIME: 1535
SAMPLER: LB / TA
WEATHER/TEMP: SUNNY / 74°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 #: 1 Turbidity Meter #: 11 Water Level: L6
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): 22.12
DEPTH TO WATER (FT BTOC): 18.04
WATER COLUMN HEIGHT (FT): = 4.08
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)]: 0.66

ADDITIONAL NOTES:

SCREEN LENGTH (FT): 10
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 19.0

* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 5.2 | 0.713 | 3.06 | 6.70 | 82.0 | 0.5 | 18.2 |
| 10 | 1.4 | 4.9 | 0.711 | 2.98 | 6.71 | 81.1 | 1.58 | 18.24 |
| 15 | 2.1 | 4.8 | 0.712 | 2.85 | 6.73 | 78.8 | 0.79 | 18.2 |
| 20 | 2.8 | 4.7 | 0.711 | 2.80 | 6.73 | 77.1 | 1.11 | 18.2 |
| 25 | 3.5 | 4.7 | 0.711 | 2.77 | 6.74 | 74.7 | 0.13 | 18.2 |
| 30 | 4.2 | 4.6 | 0.711 | 2.74 | 6.74 | 73.4 | 1.52 | 18.2 |
| 35 | 4.9 | 4.7 | 0.711 | 2.69 | 6.74 | 71.7 | 0.14 | 18.2 |
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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 (gal): 9 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: C0805OU6LB 02 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: (Y) / N

# GROUNDWATER SAMPLING FORM

Bryce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/6/21
SAMPLE ID: 21FWOU6 15 WG
TIME: 1015
LOCATION ID: MW06A
SAMPLER: DS
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP: Cloudy, 60 °F
LABORATORY ANALYSIS (circle): ~~VOC, VOC-LL, DRO/RRO~~, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 3 Turbidity Meter #: 13 Water Level: 17
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): 22.63
DEPTH TO WATER (FT BTOC): 15.93
WATER COLUMN HEIGHT (FT): = 6.7
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)]: 1.09
ADDITIONAL NOTES:
SCREEN LENGTH (FT): 12.6 - 22.6
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 16.9

* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 8.0 | 0.638 | 0.52 | 6.77 | -97.3 | 6.53 | 15.95 |
| 10 | 1.0 | 6.1 | 0.681 | 0.28 | 6.81 | -105.9 | 9.71 | 15.95 |
| 15 | 1.5 | 6.9 | 0.627 | 0.16 | 6.84 | -113.9 | 2.20 | 15.95 |
| 20 | 2.0 | 6.8 | 0.622 | 0.14 | 6.84 | -118.7 | 3.38 | 15.95 |
| 25 | 2.5 | 6.8 | 0.620 | 0.16 | 6.83 | -118.2 | 1.28 | 15.95 |
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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:
POL odor
Brown stain on tubing

## IDW PURGE WATER MANAGEMENT

VOLUME GENERATED (gal): 3.15 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: C080G0U6JS01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 8/6/21
SAMPLE ID: 21FWOU6 16 WG
TIME: 1125
LOCATION ID: MW77
SAMPLER: JB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP: Cloudy, 64°F
LABORATORY ANALYSIS (circle): ~~VOC, VOC-Lt~~, DRO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 3 Turbidity Meter #: 13 Water Level: 17
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): 22.61
DEPTH TO WATER (FT BTOC): 18.08
WATER COLUMN HEIGHT (FT): = 4.53
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)]: 0.738
SCREEN LENGTH (FT): 12.6 - 22.6
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 19.1
* 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.
ADDITIONAL NOTES:

**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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.0 | 0.929 | 0.44 | 6.72 | 109.0 | 7.13 | 18.12 |
| 10 | 1.0 | 6.9 | 0.923 | 0.35 | 6.76 | 112.2 | 3.608 | 18.13 |
| 15 | 1.5 | 6.9 | 0.922 | 0.28 | 6.77 | 114.8 | 1.18 | 18.17 |
| 20 | 2.0 | 6.8 | 0.924 | 0.26 | 6.77 | 118.4 | 0.68 | 18.18 |
| 25 | 2.5 | 6.7 | 0.922 | 0.23 | 6.77 | 119.4 | 0.01 | 18.18 |
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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: PDL Odor

## IDW PURGE WATER MANAGEMENT

VOLUME GENERATED (gal): 4.5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: C080600W5501 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
SAMPLE ID: 21FWOU6 D WG
LOCATION ID: MW82
FD SAMPLE ID / LOC ID / TIME:
LABORATORY ANALYSIS (circle): VOC, VOC-LL, DRO/RRO, Dissolved Fe/Mn, Sulfate
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable) (Y) / N

DATE: 08/6/21
TIME: 1345
SAMPLER: JS
WEATHER/TEMP: Cloudy, 66°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 #: 3 Turbidity Meter #: 13 Water Level: 17
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): 21.72
DEPTH TO WATER (FT BTOC): - 17.58
WATER COLUMN HEIGHT (FT): = 4.14
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)]: 0.67

ADDITIONAL NOTES:

SCREEN LENGTH (FT): 11.7-21.7
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 18.6

* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.6 | 0.997 | 11.50 | 6.79 | 129.2 | 0.76 | 17.62 |
| 10 | 1.0 | 7.5 | 1.001 | 11.82 | 6.79 | 132.5 | 0.65 | 17.64 |
| 15 | 1.5 | 7.6 | 1.001 | 11.14 | 6.79 | 135.1 | 0.27 | 17.64 |
| 20 | 2.0 | 7.6 | 1.001 | 11.13 | 6.79 | 137.4 | 0.43 | 17.64 |
| 25 | 2.5 | 7.5 | 0.998 | 10.90 | 6.78 | 139.6 | 0.02 | 17.64 |
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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 (gal): 4.5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: C0806DW82JS01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bryce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
SAMPLE ID: 21FWOU6 18 WG
LOCATION ID: MW 64
FD SAMPLE ID / LOC ID / TIME: —
LABORATORY ANALYSIS (circle): ~~VOC~~, ~~VOC-LL~~, DRO/RRO, Dissolved Fe/Mn, Sulfate
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (Y) / N

DATE: 08/06/21
TIME: 10:45
SAMPLER: TA
WEATHER/TEMP: 64°F cloudy/windy
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 #: 1 Turbidity Meter #: T.11 Water Level: —
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): 20.5
DEPTH TO WATER (FT BTOC): - 14.75
WATER COLUMN HEIGHT (FT): = 5.75
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)]: 0.937

ADDITIONAL NOTES:

SCREEN LENGTH (FT): 10
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 15.8

* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.6 | 0.543 | 0.32 | 7.12 | -50.6 | 18.47 | 14.85 |
| 10 | 1.3 | 7.3 | 0.541 | 0.31 | 7.14 | -55.7 | 15.42 | 14.85 |
| 15 | ~~2.6~~ 1.95 | 7.4 | 0.544 | 0.30 | 7.16 | -61.7 | 10.99 | ~~10.94~~ 14.85 |
| 20 | ~~5.2~~ 2.6 | 7.2 | 0.552 | 0.18 | 7.17 | -64.5 | 6.44 | 14.85 |
| 25 | ~~10.4~~ 3.25 | 7.2 | 0.547 | 0.20 | 7.18 | -64.6 | 5.48 | 14.85 |
| 30 | 4.4 | 7.4 | 0.547 | 0.20 | 7.19 | -71.3 | 5.92 | 14.85 |
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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 (gal): 55 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) N IDW CONTAINER ID: COC0120UUETA01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Brice ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
DATE: 08 06 21
SAMPLE ID: 21FWOU6 19 WG
TIME: 1310
LOCATION ID: MW 37
SAMPLER: TA
FD SAMPLE ID / LOC ID / TIME: —
WEATHER/TEMP: 64°F Cloudy
LABORATORY ANALYSIS (circle): ~~VOC, VOC-LL~~, DRO/RRO, Dissolved Fe/Mn, Sulfate
MS/MSD PERFORMED? Y / (N)
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): (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 #: 1 Turbidity Meter #: T-11 Water Level: —
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): 19.7
DEPTH TO WATER (FT BTOC): - 15.55
WATER COLUMN HEIGHT (FT): = 4.15
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)]: 0.676

SCREEN LENGTH (FT): 10
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 16.5

* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 13 | 0.660 | 0.96 | 7.0 | 114.7 | 1.89 | 15.65 |
| 10 | 1.5 | 12.9 | 0.649 | 0.95 | 7.01 | 116.5 | 1.62 | 15.65 |
| 15 | 2.25 | 12.8 | 0.650 | 0.94 | 7.01 | 117.6 | 1.33 | 15.65 |
| 20 | 3 | 12.8 | 0.642 | 0.93 | 7.01 | 117.6 | 0.61 | 15.65 |
| 25 | 3.75 | 12.8 | 0.642 | 0.92 | 7.01 | 117.7 | 1.12 | 15.65 |
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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 (gal): 6.5 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: COC0000116 TA01 IBC / (55gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: Y / (N)

# GROUNDWATER SAMPLING FORM

Bruce ENGINEERING

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

## ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): Former Communications Site (FCS)
SAMPLE ID: 21FWOU6 20 WG
LOCATION ID: MW03
FD SAMPLE ID / LOC ID / TIME: —
LABORATORY ANALYSIS (circle): ~~VOC, VOC LL~~, DRO/RRO, Dissolved Fe/Mn, Sulfate
VERIFIED BOTTLES HAVE CHEMICAL PRESERVATIVE PRIOR TO FILLING (if applicable): Y / N

DATE: 8/6/21
TIME: 1425
SAMPLER: JB + TA
WEATHER/TEMP: Cloudy, 66°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 #: 3 Turbidity Meter #: 13 Water Level: 17
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): 22.32
DEPTH TO WATER (FT BTOC): 15.45
WATER COLUMN HEIGHT (FT): = 6.87
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)]: 1.12

ADDITIONAL NOTES:

SCREEN LENGTH (FT): 12.3 - 22.3
WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 16.5

* 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 (during the last 3 measurements) |
|---|---|---|---|---|---|---|---|---|
| | | | ±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 | 7.2 | 0.625 | 1.69 | 7.02 | -86.9 | 146.1 | 15.46 |
| 10 | 1.0 | 7.6 | 0.625 | 0.78 | 7.04 | -102.1 | 39.84 | 15.46 |
| 15 | 1.5 | 7.7 | 0.624 | 0.51 | 7.04 | -104.6 | 26.87 | 15.46 |
| 20 | 2.0 | 7.6 | 0.625 | 0.29 | 7.05 | -107.1 | 14.45 | ↓ |
| 25 | 2.5 | 7.7 | 0.624 | 0.24 | 7.04 | -109.2 | 9.12 | |

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 (gal): 4 CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N IDW CONTAINER ID: C080606 TA01 IBC / (15gal poly)
DISPOSAL TYPE: CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
PHOTOS TAKEN: (Y) / N

## Submersible Pump Equipment Blank

**Project Name:** OU6

**Rinsate #:** OU6 - EB01

**Sample ID:** 21FWOU6EB01WKQ

**Date:** 8/5/21

**Time:** 1700

**Initials:** CS

**Analysis:** VOC, VOC-LL, Fe/Mn/SO4

**Well that the pump was last used on:** MW61

## Submersible Pump Equipment Blank

**Project Name:** OU6

**Rinsate #:** OU6 - EB02

**Sample ID:** 21FW OU6 EB02 WQ

**Date:** 8/5/21

**Time:** 1730

**Initials:** JS

**Analysis:** DRO/RRO, Diss Fe/Mn, Sulfate

**Well that the pump was last used on:** MW33

# YSI and Turbidimeter Calibration Logs

**Project Name/Location:** OU6

**YSI Model:** 556 MPS / (Pro Plus)

**Turbidimeter Model:** HF Scientific MicroTPW

**YSI Calibration**

| Equip # | Date | Temp. (°C) | pH (3 pt.) Standards: 4.00, 7.00, 10.00 | Cond. (µs/cm) Standard: 1.000 | ORP (mV) Standard: 240 | DO (mg/L) | Atm. Press. (mmHg) | Initials |
|---|---|---|---|---|---|---|---|---|
| 1 | 8/4/21 | 24.6 | 4.02-4<br>7.02-7<br>9.96-10 | 0.998<br>1.000 | 238<br>240 | 8.21<br>8.9 | 747.8 | CB |
| 1 | 8/5/21 | 24.6 | 3.98-4<br>7.06-7<br>10.07-10 | 1.018<br>1.000 | 241<br>240 | 8.22<br>8.16 | 743.8 | CB |
| 3 | 8/5/21 | 24.8 | 4.03-4<br>6.97-7<br>9.90-10 | 1.022<br>1.000 | 238.3<br>240 | 7.71<br>8.12 | 743.4 | CB |
| 1 | 8/6/21 | 22.4 | 4.02-4<br>7.06-7<br>10.16-10 | 1.019<br>1.000 | 235<br>240 | 8.98<br>8.42 | 745.1 | CB |
| 3 | 8/6/21 | 23.0 | 3.97-4<br>6.92-7<br>10.03-10 | 0.995<br>1.000 | 234.9<br>240 | 9.40<br>8.35 | 742.6 | CB |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Turbidimeter Calibration**

| Equip # | Date | 1000 NTU | 10 NTU | 0.02 NTU | Initials |
|---|---|---|---|---|---|
| 11 | 8/4/21 | ✓ | ✓ | ✓ | CB |
| 11 | 8/5/21 | ✓ | ✓ | ✓ | CB |
| 13 | 8/5/21 | ✓ | ✓ | ✓ | CB |
| 11 | 8/6/21 | ✓ | ✓ | ✓ | JS |
| 13 | 8/6/21 | ✓ | ✓ | ✓ | JS |
| | | | | | |
| | | | | | |
| | | | | | |

OU6 FT. WAINWRIGHT
CHRIS BOESE

8/4/21

0730 - SHOP - GWS PREP.
(MOVE TO OU4)

1230 - ARRIVE AT TANANA
TRAILS (OU6)

1345 - GWS MW78

1510 - GWS MW91

1655 - GWS MW47

1820 - GWS MW79 +
CLEAN UP.
→ SEE G.W. FORMS FOR DETAILS
1845 - LEAVE SITE

1905 - ARRIVE AT SHOP -
CLEAN UP

Chr Boese

Scale: 1 square = _____



OU6 FT. WAINWRIGHT
8/5/21 CHRIS BOESE
0730 - SHOP - GWS PREP +
TRAIN TRACY A

0945 - ARRIVE AT TANANA
TRAILS (OU6)

1055 - GWS MW13

1240 - GWS MW80

1350 - GWS MW61 + DUP.
+ MSMSD

1535 - GWS MW08 + CLEAN
UP. SEE ALL G.W. FORMS FOR
1600 - LEAVE SITE. DETAILS

1620 - ARRIVE AT SHOP, CLEAN
UP.
1700 - COLLECT RINSATE
Chr Boese
8/6/21
0730 - SHOP - CLEAN PUMPS. /
GWS PREP

Scale: 1 square = _____

OV6 FT. WAINWRIGHT
CHRIS BOESE

8/6/21 CONT

HELP/TRAIN TRACY A.

8/8/21

DUMP DECON WATER AT DECON WATER DISCHARGE POINT

Scale: 1 square = _____

Scale: 1 square = _____

Rite in the Rain

8/5/21
Personnel: Jill Stockley
Weather: Sunny 70°F
Task: OU6 GW Samps
+ Well ICs

1010 - on Post

1015 - Setting up MW58 + Well IC

1110 - Samp. MW58

1140 - Setting up MW33 + Well IC

1230 - Samp. MW33.
1245 - Field dup

1:30 - Setting up MW62 + Well IC

1415 - Samp MW62

1430 - Setting up MW12R + Well IC

15:25 - Samp. MW12R

15:40 - Haz waste Facility Drop off FDW
16:15 - Left Post

Scale: 1 square = _____

8/6/21

Personnel: Jill Stoltzfus
Weather: Cloudy 60°F
Task: OU6 GW Samp + Well ICs

9:15 - On Post

920 - Setting up MW06A Well IC

1015 - Samp. MW06A

1020 - Helping Tracy @ MW64

1040 - Setting up MW77 + Well IC

1150 - Setting up MW82 + Well IC

1245 - Samp. MW82

1315 - MW37 well IC

1320 - MW64 well IC

1325 - MW03 Setting up + Well IC

Scale: 1 square = _____



1425 - Samp MW03

1445 - 3489 - IDW drop off

1450 - Left Post

Scale: 1 square = _____

# APPENDIX D
# PHOTOGRAPH LOG

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## 2021 OU6 PHOTO LOG – FORMER COMMUNICATIONS SITE

OU6, 5 August 2021
Collecting parameters at well MW62. View NW.
2021_OU6 (2).jpg
Taken by: CB

OU6, 5 August 2021
Collecting parameters at well MW08. View NW.
2021_OU6 (3).jpg
Taken by: CB


OU6, 6 August 2021
Groundwater sampling at well MW03. View W.
2021_OU6 (4).jpg
Taken by: TA

# APPENDIX E
# LTMO RESULTS

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# MAROS Mann-Kendall Statistics Summary

**Project:** 2021 OU6

**User Name:** BENG

**Location:** Fort Wainwright

**State:** Alaska

**Time Period:** 10/17/2007 **to** 8/6/2021
**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 | | | | | | | | |
| MW33 | S | 19 | 19 | 0.72 | 85 | 99.9% | No | I |
| MW12R | S | 19 | 18 | 0.90 | -63 | 98.6% | No | D |
| MW58 | T | 19 | 19 | 0.39 | 17 | 71.0% | No | NT |
| MW06A | T | 20 | 20 | 0.52 | 13 | 65.0% | No | NT |
| PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP | | | | | | | | |
| MW33 | S | 19 | 13 | 1.16 | 64 | 98.7% | No | I |
| MW12R | S | 19 | 12 | 1.14 | -13 | 66.1% | No | NT |

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

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

# MAROS Mann-Kendall Statistics Summary

**Project:** 2021 OU6
**User Name:** BENG
**Location:** Fort Wainwright
**State:** Alaska

**Time Period:** 10/17/2007 **to** 8/6/2021
**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 | 19 | 17 | 2.45 | 40 | 91.3% | No | PI |
| MW77 | T | 18 | 18 | 1.38 | 30 | 86.2% | No | NT |
| PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP | | | | | | | | |
| MW62 | S | 19 | 12 | 2.22 | 32 | 85.9% | No | NT |
| MW77 | T | 18 | 11 | 1.23 | -20 | 76.2% | No | NT |

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

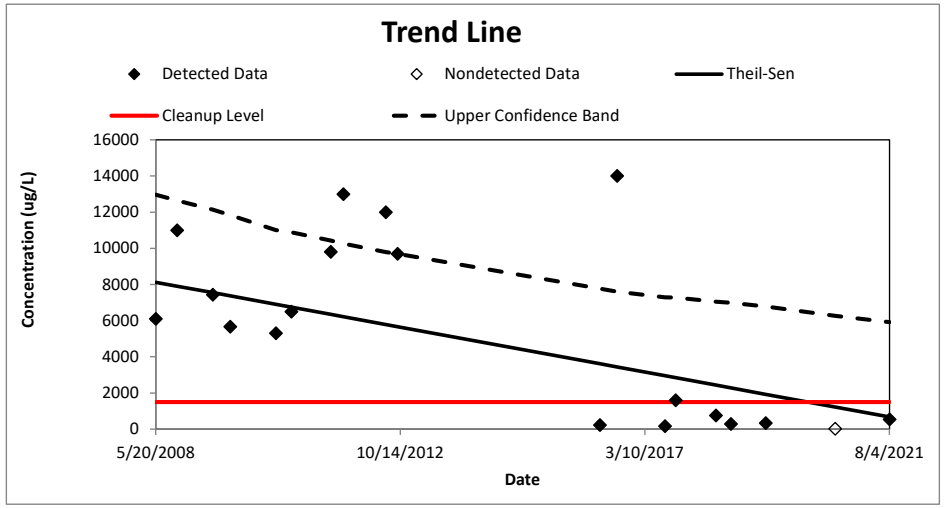
The Number of Samples and Number of Detects shown above are post-consolidation values.

# Groundwater Statistics Tool

**Site & Summary Statistics for Nonparametric Data Sets with Non-detects and Nonparametric Residuals**

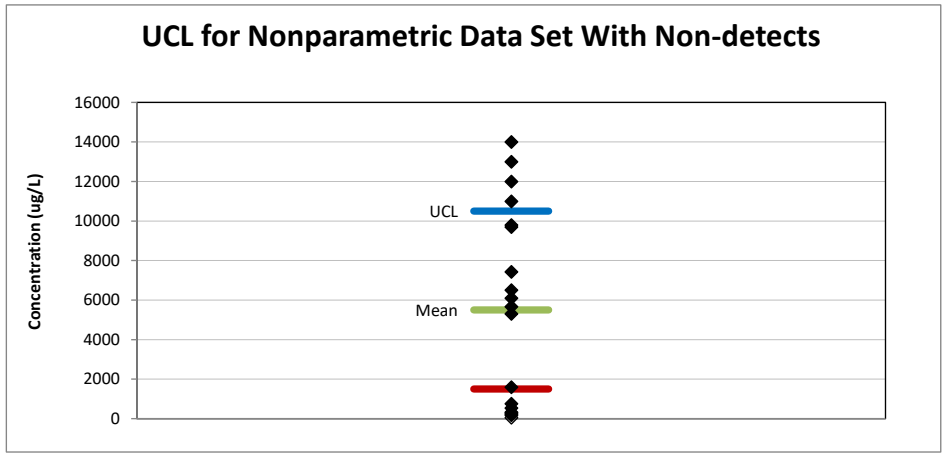
**General Information**

| | |
|---|---|
| **Analyst** | JS |
| **Date of Evaluation** | 12/13/2021 |
| **Site Name** | FCS |
| **Operable Unit** | OU6 |
| **Type of Evaluation** | Attainment |
| **Well Name/Number** | MW12R |
| **Chemical of Concern** | DRO |
| **Concentration Units** | ug/L |
| **Cleanup Level** | 1500 |
| **Source of Cleanup Level** | MCL |
| **Confidence Level** | 95% |
| **Risk of False Outlier Rejection** | 1% |
| **Number of Results** | 19 |
| **Outliers present?** | No |
| **Number of Non-Detects** | 1 |




**Trend Analysis**

| | |
|---|---|
| **Trend Type** | Nonparametric |
| **Method** | Theil-Sen Line, Mann-Kendall Test |
| **Is the Upper Confidence Band above the cleanup level?** | **NA** |
| **Slope** | -1.54 |
| **Intercept** | 69200 |
| **Test Result** | **Decreasing** |
| **When concentration is predicted to achieve the cleanup level** | **NA** |
| **When concentration is predicted to exceed the cleanup level** | **NA** |




**UCL Analysis**

| | |
|---|---|
| **Distribution Type** | Nonparametric |
| **Test** | KM Chebyshev UCL |
| **Mean** | 5500 |
| **95% UCL** | **10500** |
| **Is the 95% UCL greater than the cleanup level?** | **Yes** |

Previous Step: Trend Screen | Previous Step: UCL Screen | Restart: Data Input Screen

# MAROS Spatial Moment Analysis Summary

**Project:** 2021 OU6

**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 |
| 8/6/2021 | 2.6E+01 | 1,380,713 | 3,959,946 | 142 | 1,826 | 17,283 | 7 |

**Project:** 2021 OU6

**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 | 0.39 | 4 | 61.9% | NT |
| **1st Moment: Distance to Source** | | | | | |
| | PHC as DIESEL FUEL | 0.17 | 8 | 76.2% | NT |
| **2nd Moment: Sigma XX** | | | | | |
| | PHC as DIESEL FUEL | 0.04 | -8 | 76.2% | S |
| **2nd Moment: Sigma YY** | | | | | |
| | PHC as DIESEL FUEL | 0.20 | -2 | 54.0% | S |

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.

# MAROS Sampling Location Optimization Results

**Project:** 2021 OU6 **User Name:** BENG

**Location:** Fort Wainwright **State:** Alaska

**Sampling Events Analyzed:** **From** Sample Event 12 (5/19/2016) **to** Sample Event 20 (8/6/2021)

**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 | ☑ | 0.246 | 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 | ☑ | 0.555 | 0.435 | 0.677 | ☐ |
| MW35 | 1380346.38 | 3960282.00 | ☑ | 0.347 | 0.268 | 0.525 | ☐ |
| MW37 | 1380539.63 | 3960388.00 | ☑ | 0.216 | 0.029 | 0.332 | ☐ |
| MW58 | 1380547.88 | 3960074.25 | ☑ | 0.225 | 0.113 | 0.318 | ☐ |
| MW64 | 1380852.63 | 3959938.75 | ☑ | 0.764 | 0.442 | 0.874 | ☐ |
| MW82 | 1380712.63 | 3960750.75 | ☑ | 0.498 | 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 Sampling Frequency Optimization Results

**Project:** 2021 OU6 **User Name:** BENG

**Location:** Fort Wainwright **State:** Alaska

**The Overall Number of Sampling Events:** 9

**"Recent Period" defined by events:** **From** Sample Event 12 5/19/2016 **To** Sample Event 20 8/6/2021

**"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 Mann-Kendall Statistics Summary

**Project:** 2021 OU6

**User Name:** BENG

**Location:** Fort Wainwright

**State:** Alaska

**Time Period:** 10/17/2007 **to** 8/6/2021
**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 | 18 | 16 | 0.57 | -57 | 98.4% | No | D |
| MW79 | T | 17 | 17 | 1.09 | 40 | 94.6% | 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)

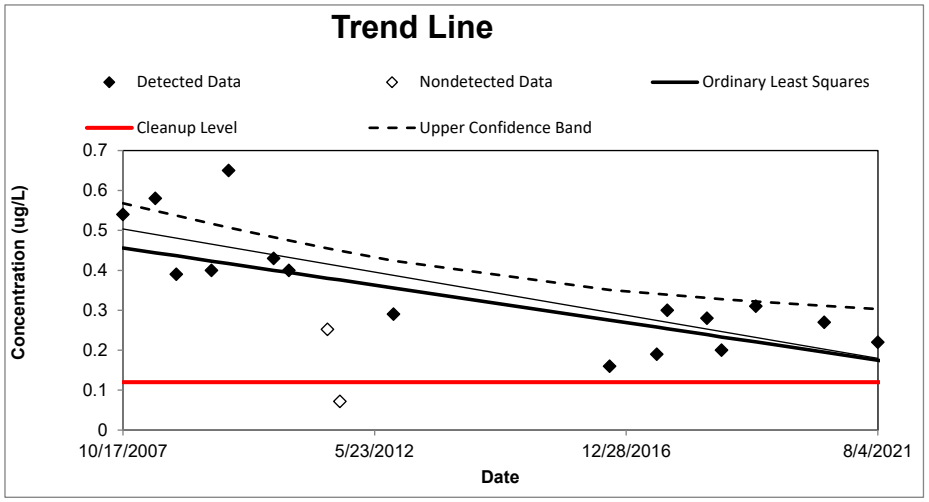
The Number of Samples and Number of Detects shown above are post-consolidation values.

# Groundwater Statistics Tool

**Site & Summary Statistics for Nonparametric Data Sets with Non-detects and Normal Residuals**

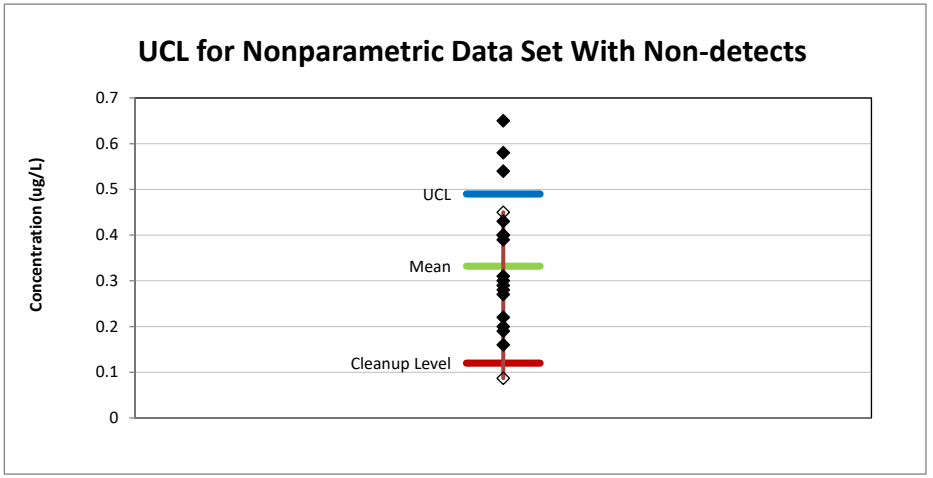
**General Information**

| | |
|---|---|
| **Analyst** | JS |
| **Date of Evaluation** | 12/13/2021 |
| **Site Name** | FCS |
| **Operable Unit** | OU6 |
| **Type of Evaluation** | Remediation |
| **Well Name/Number** | MW47 |
| **Chemical of Concern** | TCP |
| **Concentration Units** | ug/L |
| **Cleanup Level** | 0.12 |
| **Source of Cleanup Level** | MCL |
| **Confidence Level** | 95% |
| **Risk of False Outlier Rejection** | 1% |
| **Number of Results** | 18 |
| **Outliers present?** | No |
| **Number of Non-Detects** | 2 |




**Trend Analysis**

| | |
|---|---|
| **Trend Type** | Normal |
| **Method** | Ordinary Least Squares |
| **Is the Upper Confidence Band above the cleanup level?** | **Yes** |
| **Slope** | -0.0000558 |
| **Intercept** | 2.65 |
| **$R^2$** | 0.6451 |
| **Test Result** | **Decreasing** |
| **When concentration is predicted to achieve the cleanup level** | **4/18/2024** |
| **When concentration is predicted to exceed the cleanup level** | **NA** |




**UCL Analysis**

| | |
|---|---|
| **Distribution Type** | Nonparametric |
| **Test** | KM Chebyshev UCL |
| **Mean** | 0.332 |
| **95% UCL** | **0.49** |
| **Is the 95% UCL greater than the cleanup level?** | **Yes** |


Previous Step: Trend Screen

Previous Step: UCL Screen

Restart: Data Input Screen

# Groundwater Statistics Tool

**Site & Summary Statistics for Nonparametric Data Sets with Non-detects and Normal Residuals**

**General Information**

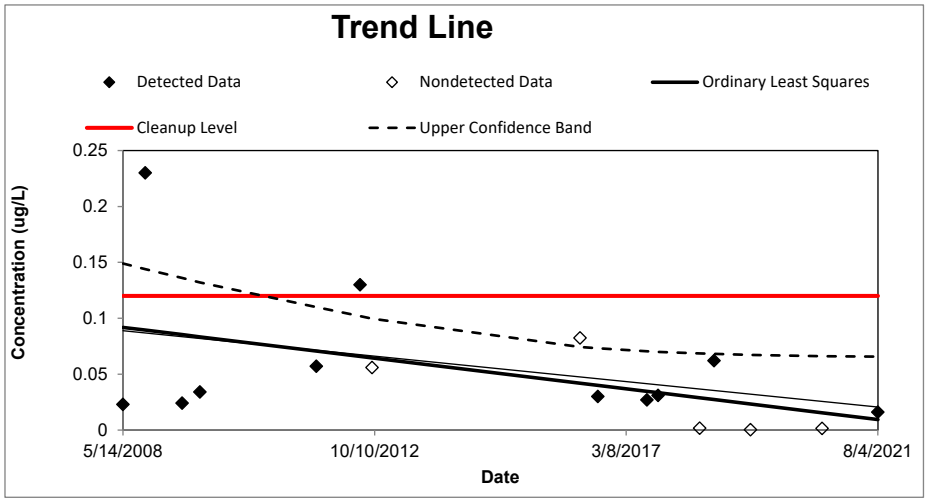
| | |
|---|---|
| **Analyst** | JS |
| **Date of Evaluation** | 12/13/2021 |
| **Site Name** | FCS |
| **Operable Unit** | OU6 |
| **Type of Evaluation** | Attainment |
| **Well Name/Number** | MW08 |
| **Chemical of Concern** | TCP |
| **Concentration Units** | ug/L |
| **Cleanup Level** | 0.12 |
| **Source of Cleanup Level** | MCL |
| **Confidence Level** | 95% |
| **Risk of False Outlier Rejection** | 1% |
| **Number of Results** | 16 |
| **Outliers present?** | Yes |
| **Number of Non-Detects** | 5 |

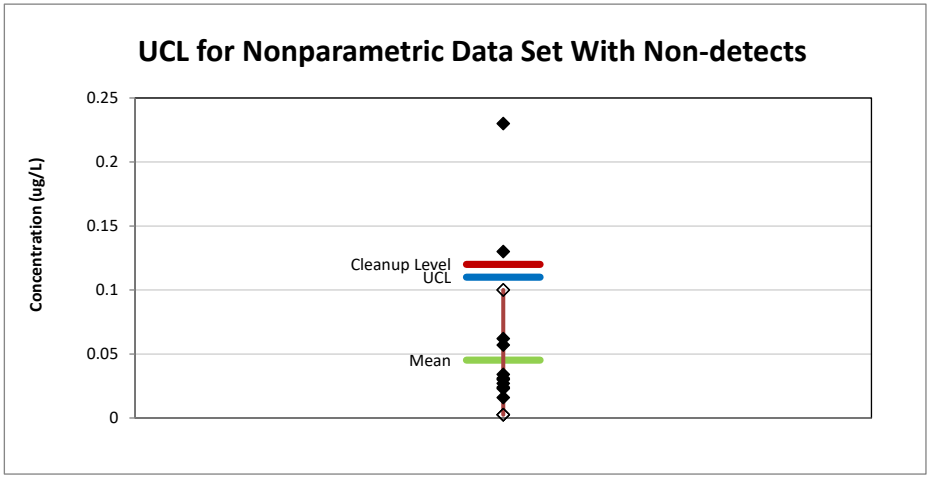
**Trend Analysis**

| | |
|---|---|
| **Trend Type** | Normal |
| **Method** | Ordinary Least Squares |
| **Is the Upper Confidence Band above the cleanup level?** | **NA** |
| **Slope** | -0.0000171 |
| **Intercept** | 0.767 |
| **$R^2$** | 0.1396 |
| **Test Result** | **Decreasing** |
| **When concentration is predicted to achieve the cleanup level** | **NA** |
| **When concentration is predicted to exceed the cleanup level** | **NA** |

**UCL Analysis**

| | |
|---|---|
| **Distribution Type** | Nonparametric |
| **Test** | KM Chebyshev UCL |
| **Mean** | 0.0452 |
| **95% UCL** | **0.11** |
| **Is the 95% UCL greater than the cleanup level?** | **No** |




Previous Step: Trend Screen | Previous Step: UCL Screen | Restart: Data Input Screen

# MAROS Mann-Kendall Statistics Summary

**Project:** 2021 OU6

**User Name:** BENG

**Location:** Fort Wainwright

**State:** Alaska

**Time Period:** 10/17/2007 **to** 8/6/2021
**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 | 19 | 19 | 1.01 | -126 | 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)

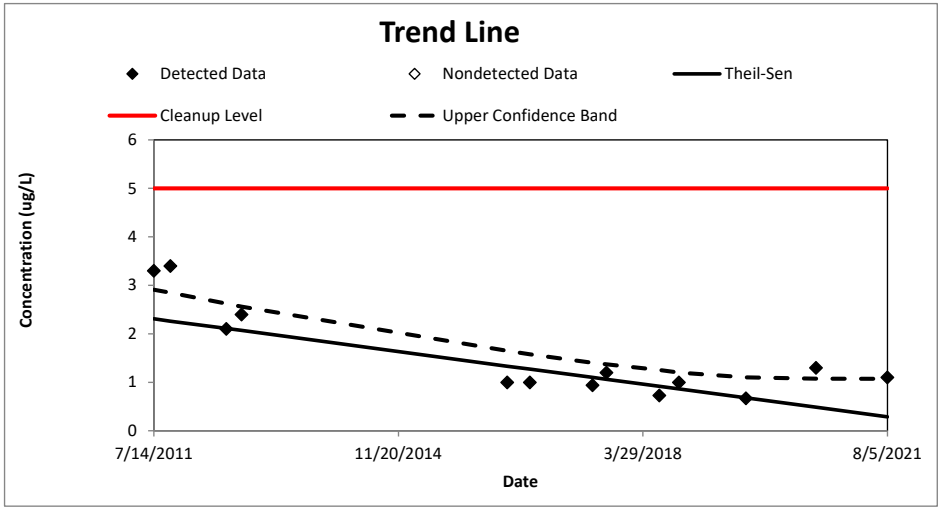
The Number of Samples and Number of Detects shown above are post-consolidation values.

# Groundwater Statistics Tool

**Site & Summary Statistics for Nonparametric Data Sets with Nonparametric Residuals**

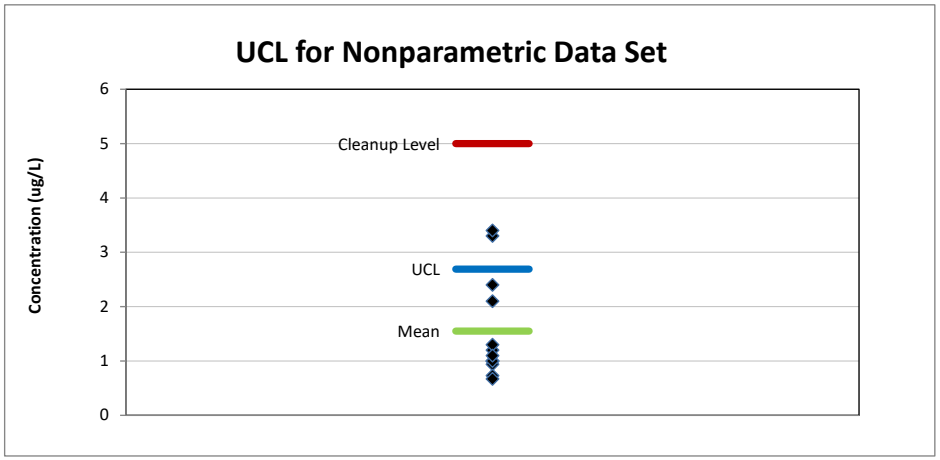
**General Information**

| | |
|---|---|
| **Analyst** | JS |
| **Date of Evaluation** | 12/13/2021 |
| **Site Name** | FCE |
| **Operable Unit** | OU6 |
| **Type of Evaluation** | Attainment |
| **Well Name/Number** | MW61 |
| **Chemical of Concern** | TCE |
| **Concentration Units** | ug/L |
| **Cleanup Level** | 5 |
| **Source of Cleanup Level** | MCL |
| **Confidence Level** | 95% |
| **Risk of False Outlier Rejection** | 1% |
| **Number of Results** | 13 |
| **Outliers present?** | No |
| **Number of Non-Detects** | 0 |




**Trend Analysis**

| | |
|---|---|
| **Trend Type** | Nonparametric |
| **Method** | Theil-Sen Line, Mann-Kendall Test |
| **Is the Upper Confidence Band above the cleanup level?** | **NA** |
| **Slope** | -0.00055 |
| **Intercept** | 24.7 |
| **Test Result** | **Decreasing** |
| **When concentration is predicted to achieve the cleanup level** | **NA** |
| **When concentration is predicted to exceed the cleanup level** | **NA** |




**UCL Analysis**

| | |
|---|---|
| **Distribution Type** | Nonparametric |
| **Test** | Chebyshev UCL |
| **Mean** | 1.55 |
| **95% UCL** | **2.69** |
| **Is the 95% UCL greater than the cleanup level?** | **No** |


Previous Step: Trend Screen

Previous Step: UCL Screen

Restart: Data Input Screen

# REVIEW 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
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Fax: 907.451.2155
www.dec.alaska.gov

File: 108.38.085

June 28, 2022

Electronic Delivery Only
Dept. of the Army
Directorate of Public Works
ATTN: AMIM-AKP-E (K. DePalma)
1046 Marks Road
Fort Wainwright, Alaska 99703

**RE: ADEC Review of the Responses to Comments on the *Draft 2021 Monitoring Report, Former Communications Site, Operable Unit 6, Fort Wainwright, AK* Dated January 2022**

Dear Ms. DePalma:

The Alaska Department of Environmental Conservation (ADEC) has reviewed the responses to comments (RTCs) for the above-referenced document which details site activities and presents groundwater monitoring results from 2021 at Operable Unit 2 (OU2) on Fort Wainwright, Alaska (FWA). OU2 currently consists of two Three-Party sites within the Defense Reutilization Marketing Office (DRMO) yard, denoted as DRMO1 and DRMO4. Tetrachloroethylene (PCE) and its daughter products were not detected above remediation goals (RGs) described in the Record of Decision (ROD) for the site. Diesel range organics (DRO) were detected above the regulatory cleanup level found in 18 AAC 75.345, Table C in well AP-7560. The report recommends continued monitoring at both DRMO1 and DRMO4.

ADEC's comments have been addressed. Please incorporate the comments and provide a clean final for approval.

If there are any questions, please contact me at (907) 451-2131, or at tim.sharp@alaska.gov.

Sincerely,

Digitally signed by Timothy Sharp
Date: 2022.06.28 15:26:22 -08'00'

Timothy Sharp

Environmental Program Specialist

***Enclosure: ADEC Review Comments w/ Responses***

cc: Peter Baker, FWA ENVR
Matthew Sprau, FWA ENVR Branch Chief
Sandra Halstead, EPA
Bob Hazlett, USACE
Julie Allan, USACE
Roger Walton, USAEC
Cascade Galasso, ADEC

**REVIEW COMMENTS**

**PROJECT: Fort Wainwright, AK**
**DOCUMENT: Draft 2021 Monitoring Report, Former Communications Site, Operable Unit 6, Received January 2022**

| ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION | DATE: 05/03/2022<br>REVIEWER: Timothy Sharp<br>PHONE: (907) 451-2131 | Action taken on comment by: U.S. Army Garrison Alaska – DPW Environmental |
|---|---|---|

| Item No. | Drawing Sheet No., Spec. Para. | COMMENTS | REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain) | ARMY RESPONSE | ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE) | ARMY RESPONSE |
|---|---|---|---|---|---|---|
| 1 | General Comment | Please update the ROD RG for 1,2,3-TCP to 0.0075 µg/L where applicable in the document, such as Table 1-2, Section 3.3, Graph 3-5, Table 3-3, Section 4.3, Graph 4-2, Section 5.2, and Section 5.4. According to the Fifth Five-Year Review (2021), "Changes to a ROD ARAR have been promulgated since the Fourth Five-Year Review. CULs in 18 AAC 75 are listed as an ARAR in the OU6 ROD (USACE, 2014). In 2016, amendments to 18 AAC 75 updated calculation methods and values of CULs for soil and groundwater. Subsequent updates to the CULs occurred in 2018 and 2020. ROD project cleanup levels for…1,2,3-TCP were compared to current 18 AAC 75 CULs…The 1,2,3-TCP project cleanup level identified in the ROD is less conservative than the current 18 AAC 75 CUL; the project cleanup level cancer risk exceeds the acceptable range (at 1.6x10-4) and the project cleanup is no longer protective." The Fifth Five Year Review states later in Table F-6 that "Table C establishes groundwater cleanup levels for the site (i.e., DRO, RRO, and 1,2,3-TCP)." | Noted | Updates to the OU6 ROD RGs are presently under Army review. | Accept. What is the estimated time frame for these updates? | |
| 2 | Executive Summary, TCE Groundwater Plume Summary | The report states, "Although TCE daughter products were not identified as ROD COCs, continued formation of daughter products can be reasonably expected in an anaerobic aquifer and should continue to be monitored." Later in the report it is recommended MW61 and MW80 be removed from the sampling program. Please correct this discrepancy. | Accept | Since TCE in well MW61 has not exceeded the RG for 11 years (and has never exceeded in MW80) and the daughter products remain approximately an order of magnitude below the EPA MCLs, it is recommended that wells MW61 and MW80 be removed from the sampling | Accept. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | program. The second paragraph in the TCE Executive Summary will be revised as follows for consistency with the Recommendations section: *"TCE reductive dechlorination daughter products, cis-1,2-dichloroethene (DCE), trans-1,2-DCE, and vinyl chloride have been detected in one well (MW61) at concentrations less than the Federal Maximum Contaminant Levels (MCLs) by approximately an order of magnitude. Continued formation of daughter products shows that reductive dichlorination is occurring in the anaerobic aquifer."* | | |
| 3 | Sections 5.3 and 5.4 | Please add historical data to support the decision to remove all TCE plume wells from the sampling program. The current language in the report is not enough to justify the removal of TCE sampling as it is unclear if the full extent of the plume has been delineated and shown to have attenuated to achieve remedial goals. DEC is open to the recommendation of removing the wells from the sampling program provided sufficient context is provided for review. | Noted | Section 1.3.2 provides a summary of investigations that were conducted at OU6. A total of 94 wells were installed at OU6 from 2005 to 2012 including wells within the TCE plume. As COCs for given areas were established and plumes were delineated, analytical programs were decreased, and wells were eventually decommissioned with ADEC approval (which included 57 wells in 2016 and 6 wells in 2017). For reference, Figure A-6 in the 2017 Annual Report (USACE 2018) shows the locations of the decommissioned and active wells. As a conservative measure, wells MW61 and MW80 were retained in the sampling program so that any remaining TCE contamination could be monitored. However, as shown in Figure 3-4, TCE has continued to remain below the RG in MW61 since 2011 and has never exceeded the RG in MW80 since its installation. The recommendation to remove the two wells from the program are also based on achieving RGs in accordance with EPA guidance. MW61 reached the RG (attainment complete) in accordance with EPA requirements in 2014 and MW80 has never exceeded the RG since its installation and has not been | Accept. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | detected for 11 years. Therefore, statistical calculations and several years of observations supports the removal MW61 and MW80 from the monitoring well network. | | |
| 4 | Sections 5.3 and 5.4 | Daughter products may be more mobile and picked up in downgradient wells. DEC recommends sampling for daughter products in wells downgradient from the TCE plume (for example MW62 and MW12R should be sampled for daughter products given their proximity to MW61 and MW80). | Disagree | MW12R and MW62 had no TCE or daughter product exceedances from 2007-2016, so VOC analysis was removed from the monitoring program for these two wells in 2017 with concurrence from the RPMs. TCE concentrations have not exceeded the RG in either of the source wells since 2010, and current concentrations of TCE daughter products in the source wells are either non detect or an order of magnitude below the cleanup level. Since neither TCE nor its daughter products are currently present in the source wells, and they have not been detected previously downgradient, additional, the Army disagrees that additional sampling of the downgradient wells is needed. | Accept. | |
| 5 | Section 5.4 | ADEC disagrees with the recommendation to remove MW08 from the sampling program. Detections above the Table C cleanup value have occurred sporadically over the years, indicating some upgradient mobility of contaminants. See Comment 1 for more information. | Accept | MW08 will remain in the OU6 monitoring program. | Accept. | |
| 6 | Section 5.4 | DEC recommends installing a sentry well for the TCP plume in a more downgradient location from MW47 given the groundwater flow direction, more to the west of MW78. | Noted | As shown on both Figure 3-1 and in the OU6 ROD, groundwater flow in the vicinity and downgradient of MW47 is in a more northerly direction due to the influence of the Building 3559 Water Supply Well. Additionally, three wells to the north-northwest of MW47 (MW40, MW41, MW42, and MW46) were decommissioned in 2016 with concurrence from the regulatory partners. Therefore, the Army considers the existing sentry wells to be sufficient.<br>The groundwater flow direction arrow on Figure 3-3 will be modified to reflect | Accept. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | the more northerly GW flow direction that is characteristic in this area. | | |
| 7 | | --End of Comments-- | | | | |

**REVIEW COMMENTS Dated February 2022**

**PROJECT: Fort Wainwright, AK**
**DOCUMENT: Draft 2021 Monitoring Report, Former Communications Site, Operable Unit 6**

| U.S. Environmental Protection Agency | DATE: 05/17/2022<br>REVIEWER: Sandra Halstead<br>PHONE: 907-726-7279 | Action taken on comment by: U.S. Army Garrison Alaska – DPW Environmental |
|---|---|---|

| Item No. | Drawing Sheet No., Spec. Para. | COMMENTS | REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain) | ARMY RESPONSE | ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE) | ARMY RESPONSE |
|---|---|---|---|---|---|---|
| 1 | Section 1.3.2, First Sentence | a. This is a confusing statement. The ROD-selected remedy occurred in 2013; Groundwater monitoring may have started in 2005 and data used from the RI to post ROD is used to assess MNA and contaminant trends.<br>b. Add PFAS investigation in 2020 to the bullet list of OU6 investigation activities. | Accepted | a. The first sentence will be revised as follows: *"Groundwater monitoring to assess contaminant levels and contaminant trends began at OU6 in 2005 and continued through the Remedial Investigation (RI; USACE 2010). Based on this data, MNA was the chosen remedy for the site. The effectiveness of the ROD-selected remedy continues to be assessed through ongoing groundwater monitoring."*<br>b. The PFAS investigation in 2020 will be added as the last bullet point under post-RI activities in Section 1.3.2 as follows: *"In 2020, a post-wide preliminary assessment (PA) and site inspection (SI) for per- and polyfluoroalkyl substances (PFAS) was conducted, which included the OU6 source areas (USACE 2022)."* | A | |
| 2 | Section 2.1 | The OU2 report suggests all wells be resurveyed. Does this need to be done at OU6 also? | Noted | All OU6 wells were surveyed in September 2019 using NAVD88 and do not need to be resurveyed. In contrast, the OU2 survey data was collected under two different vertical datums (NGVD29 (old) and NAVD88 (new)) over a span of several years. | A | |

**REVIEW COMMENTS Dated February 2022**

**PROJECT: Fort Wainwright, AK**

**DOCUMENT: Draft 2021 Monitoring Report, Former Communications Site, Operable Unit 6**

| U.S. Environmental Protection Agency | DATE: 05/17/2022<br>REVIEWER: Sandra Halstead<br>PHONE: 907-726-7279 | Action taken on comment by: U.S. Army Garrison Alaska – DPW Environmental |
|---|---|---|

| Item No. | Drawing Sheet No., Spec. Para. | COMMENTS | REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain) | ARMY RESPONSE | ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE) | ARMY RESPONSE |
|---|---|---|---|---|---|---|
| 3 | Figure 1-1 | Why does the OU6 land use control boundary exclude the Hex-roofed buildings when the Main DRO plume wells are within in? Revise the boundary to include all wells that are monitored as a part of the OU6 remedial action. | Accepted | The LUC boundary will be modified to show a straight continuous boundary along Neely Road on the north side of OU6. | A | |
| 4 | Figure 3-2 | MW58 is not the most downgradient delineation of the Main DRO plume. Why isn't MW37 sampled? Adjust the LUC boundary to include all areas with remedial network monitoring wells. Adjust the plume boundary as dashed since it is inferred and not defined in the downgradient direction. | Noted | MW58 is the most downgradient well within the DRO plume (defined here as results that exceed the ROD RG). MW37 is included in the monitoring well network and has been since its installation. MW37 has not shown to have contaminants at concentrations exceeding the ROD RG. Only sample results for wells that have exceeded the ROD RGs since 2007 are shown in Figure 3.2 (as stated in Note 6 of the figure). This also applies to DRO plume wells MW64 and MW82, which are sampled but have no analytical results shown.<br><br>Please see response to Comment 3 regarding LUC boundaries. | A | |
| 5 | | --End of Comments-- | | | | |